NATIONAL BUREAU OF STANDARDS REPORT

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PROPOSED DRAFT OF FEDERAL SPECIFICATION AA-R-211d

REFRIGERATORS, ELECTRIC, SELF-CONTAINED, DOMESTIC TYPE

by

C. W. Phillips
and
P. R. Achenbach

to

Mechanical Engineering Division
Headquarters, Quartermaster Research and Development Command

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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C. W. Phillips
P. R. Achenbach

Heating and Air Conditioning Section
Building Technology Division

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Headquarters, Quartermaster Research and Development Command
Natick, Massachusetts

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PROPOSED DRAFT

REFRIGERATORS, ELECTRIC, SELF-CONTAINED, DOMESTIC TYPE

AA-R-211d

1. SCOPE AND CLASSIFICATION

1.1 Scope - Refrigerators covered by this specification are self-contained and electrically-operated. They are of the domestic type designed for operation in an ambient temperature up to 110°F. This specification does not include all types of these refrigerators which are available, but is intended to cover only those types used in quantity by the Federal Government.

1.2 Classification

1.2.1 Types - Refrigerators are classified in four types for the purposes of this specification depending on whether or not they contain a frozen food storage compartment which provides proper conditions for frozen food storage as required in 3.5.1, and whether defrosting of the cooling unit for the general food compartment is manually-initiated (started by the user when desired) or automatically-initiated (started by a mechanical controller). The terms "manually-initiated" and "automatically-initiated" refer only to the manner of starting the defrost and not to the means by which the defrost is accomplished. See 3.5.3 for defrosting requirements for the four types. All types must provide a means that will make ice in accordance with the requirements of this specification.

Type I Without frozen food storage compartment; with manually-initiated defrost.

Type II Without frozen food storage compartment; with automatically-initiated defrost.

Type III With frozen food storage compartment; with manually-initiated defrost.

Type IV With frozen food storage compartment; with automatically-initiated defrost.

A defrosting means is not required by this specification for the cooling surfaces in the frozen food storage compartments of Type III and IV refrigerators when these cooling surfaces are isolated from the general food compartment. Some models of Type III and IV refrigerators have a common cooling surface for the general food compartment and frozen food storage compartment. Because these models must be capable of defrosting the common cooling surface in accordance with the requirements of 3.5.3, a separate defrosting of the frozen food storage compartment is not needed. Unless otherwise specified in the invitation to bid, contract, or order, Type II refrigerators may be supplied in lieu of Type I, and Type IV refrigerators may be supplied in lieu of Type III.

1.2.2 Sizes - Refrigerator sizes shall be in accordance with Table I, as specified in the invitation to bid, contract, or order.

2. APPLICABLE SPECIFICATIONS AND OTHER PUBLICATIONS

2.1 Federal Specifications - The following Federal Specifications, of the issues in effect on date of invitation for bids, form a part of this specification:

CC-M-636 - Motors; Fractional Horsepower, (Alternating-Current).
QQ-A-359 - Aluminum-Alloy (AL-3)(Aluminum-Manganese); Plate and Sheet.
QQ-S-766 - Steel, Corrosion-Resisting, Plates, Sheets, Strips, and Structural Shapes.
QQ-M-151 - Metals; General Specification for Inspection of.
LP-406 - Plastics, Organic: General Specifications, Test Methods.
RR-P-0021 - Packaging and Packing of Porcelain Enamel Products and Major Household Appliances.

(Copies of Federal Specifications and the Index of Federal Specifications and Standards may be obtained upon application accompanied by check, money order, cash or Government Printing Office coupons, to the General Services Administration, Business Service Center, Region 3, Seventh and D Streets, S.W., Washington 25, D.C. This office will also honor deposit account numbers issued by the Government Printing Office. Prices may be obtained from the Index of Federal Specifications and Standards or from the GSA Regional Offices.

Single copies of this specification and other product specifications required for bidding purposes are available without charge at the GSA Regional Offices in Boston, New York, Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, Seattle, and Washington, D.C.).

2.2 Other publications - The following publications, of the issues in effect on date of invitation for bids, form a part of this specification:

Governmental:

National Bureau of Standards Commercial Standard CS131-46 - Industrial Mineral Wool Products, All Types - Testing and Reporting.

Nongovernmental:

Underwriters' Laboratories, Inc. - Standard for Unit Refrigerating Systems.

American Standards Association Standard B38.1 - American Standard Method of Computing Food-Storage Volume and Shelf Area of Automatic Household Refrigerators.

American Standards Association Standard B38.2 - American Standard Test Procedures for Household Electric Refrigerators.

ASTM Standard D883 - Definition of Terms Relating to Plastics (Tentative).

ASTM Specification D1248 - Polyethylene Molding and Extrusion Materials (Tentative).

ASTM Specification D744 - Nonrigid Vinyl Chloride Plastics (Tentative).

ASTM Specification D395 - Methods of Test of Compression set of Vulcanized Rubber.

(Copies of ASTM specifications may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.)

(Copies of National Electrical Code may be obtained from the National Board of Fire Underwriters, 85 John Street, New York 7, N.Y.; 222 West Adams Street, Chicago, Ill.; Merchants Exchange Building, San Francisco 4, Calif.)

(Copies of Underwriters' Laboratories, Inc., standards may be obtained from the Underwriters' Laboratories, Inc., 161 Sixth Avenue, New York 13, N.Y.; 207 East Ohio Street, Chicago 11, Ill.; or 500 Sansome Street, San Francisco 11, Calif.)

3. REQUIREMENTS

3.1 Overall Dimensions - Maximum refrigerator dimensions shall be in accordance with the requirements of Table I. The depth of the refrigerator measured from the center of the door hinge pin to the back of the most remote component on the rear of the assembled refrigerator shall not exceed 25-1/2 inches. The depth measured from the back of the most remote component on the rear of the refrigerator to the front edge of the foremost component of the refrigerator shall not exceed 33-1/2 inches. The maximum width and height shall be exclusive of removable brackets or hardware, except that the maximum height shall include legs, where provided. It shall be possible to move the refrigerator through a clear opening 30 inches wide without removing more than the door and/or hardware.

3.2 Storage Capacity - The total storage volume shall be equal to or greater than the values shown in Table I. The total storage volume shall be defined as the sum of the general storage volume, the frozen food storage volume, and the ice freezing volume as described in the American Standards Association Standard B38.1.

For Type I and II refrigerators the volume of the general food compartment shall be at least 85 percent of the total storage capacity of the refrigerator as shown in Table I.

For Type III and IV refrigerators the volume of the general food compartment and the volume of the frozen food storage compartment shall be equal to or greater than the values shown in Table I.

The weight of water held by all of the ice cube trays, with grids in place, shall equal or exceed the ice capacity shown in Table I.

TABLE I

REFRIGERATOR DIMENSIONS AND CAPACITIES

Size	Types	Minimum Capacity					Maximum Dimensions*	
		Total Storage Vol. Cu Ft	General Storage Vol. Cu Ft	Froz. Food** Storage Vol. Cu Ft	Net Shelf Area Sq. Ft.	Ice Capacity Lb	Width In.	Height In.
7	I & II	7.0	6.0	--	11	3.5	26	58
	III	7.0	4.9	0.80	11	4	26	58
8	I & II	7.6	6.5	--	12	3.5	31	60
	III & IV	7.6	5.3	1.00	12	4	31	60
9	I & II	8.6	7.3	--	14	4	32	61
	III & IV	8.6	6.0	1.10	14	6	32	61
10	I & II	9.5	8.1	--	16	4	33	63
	III & IV	9.5	6.6	1.20	16	6	33	63
11	III & IV	10.5	6.8	1.50	17	6	33	67
12	III & IV	11.5	7.5	2.0	18	6	35	68
13 to 15	III & IV	12.5	8.1	2.1	20	8	40	68

*Max. depth for all sizes from center of door hinge pin to rear 25-1/2 in.
Max. overall depth for all sizes from front to back of complete refrigerator 33-1/2 in.

**Frozen Food Storage Volume based on 35 lb. per cu ft of frozen food storage volume.

3.3 Net Shelf Area - The net shelf area shall be equal to or greater than the shelf area shown in Table I. The net shelf area shall be defined as the sum of the area of the main shelves, door shelves, bottoms of suspended containers, the liner, the shelf areas in the frozen food storage section, in conformance with American Standards Association Standard B38.1.

3.4 Material and workmanship - All materials forming a part of the finished product shall be new, suitable for the purpose for which they are used and shall be free from all defects that may affect the serviceability and appearance of the finished product. Workmanship shall be first class.

3.4.1 Structural Soundness - The assembled refrigerator shall not be visibly damaged as a result of the drop test specified in 4.3.9. Inspection for visible damage may include all components and shall include interior and exterior liners; all plastic parts; all interior shelves, trays, baffles, and special storage vessels including their supports; condensing unit; cooling unit; frozen food compartment; and the refrigerator door. Visible damage shall include, for example, crazing, cracking, or permanent distortion of plastic and enamelled parts; cracking or permanent distortion of metal parts; dislocation of condensing unit, cooling unit, frozen food compartment, interior liner, or the refrigerator door.

3.4.2 Protection against damage by corrosion and electrolytic action.

3.4.2.1 Corrosion-resistance requirement - Unless otherwise restricted in this specification, wherever a corrosion-resisting metal or a metal treated to resist corrosion is required in this specification, it shall be not more than mildly attached after four hours' exposure in a salt-spray test conducted in accordance with Federal Specification QQ-M-151.

Corrosion-resisting steel, unless otherwise restricted in this specification, shall be tainless steel containing not less than 18 percent chromium and 8 percent nickel and meeting the requirements for class 1 material in Federal Specification QQ-S-766.

Only aluminum alloys conforming to Federal Specification QQ-A-359 shall be used for parts fabricated from aluminum-alloy sheets or extrusions.

3.4.2.2 Materials requiring corrosion-resistance - Unless otherwise required in this specification, all metals shall be corrosion resisting or shall be treated in a manner to render them resistant to corrosion.

3.4.2.3 Retreatment after fabrication - Corrosion-resisting material shall be normalized, and material treated for corrosion resistance shall be retreated to restore or replace the corrosion-resisting properties, before being assembled in any unit when fabrication tends to reduce or remove those properties.

3.4.2.4 Protection against electrolytic or galvanic corrosion - Refrigerators furnished under this specification shall be constructed with careful attention to protection against electrolytic or galvanic corrosion. Joints between dissimilar metals which may become wetted in service shall be protected against electrolytic or galvanic corrosion by proper selections of materials, plating, isolation, insulation, paint, area relationship, gaskets or other means. Any bolts, nuts, pins, screws and such other fastenings and fittings of metal shall be of the same material as the materials being joined or supported or shall be cathodic to the materials being joined or supported.

3.4.3 Refrigeration system - All materials used in construction of the refrigeration system shall be suitable for the refrigerant employed, and no material shall be used that will deteriorate due to chemical action of the refrigerant or the oil or the combination of both.

3.4.4 Chromium plating - Chromium plating as specified herein shall consist of chromium finish over a coating of nickel that has been applied directly to the base metal or over a coating of copper in accordance with the following requirements.

3.4.4.1 Plated surfaces - Plated surfaces of brass, aluminum, and zinc alloy shall be smooth, and the plating shall be done in a manner that will produce a durable, uniform finish. Plated finishes shall be bright or polished when visible

on the exterior of the refrigerator .

3.4.4.2 Chromium, nickel, and copper coatings - Chromium finish shall be applied over a coating of nickel. The nickel coating shall be applied either direct or over a coating of copper as provided in table II below. Each coating shall completely cover all surfaces that are visible after installation, and shall conform to the thicknesses shown in table II for regular grade R.

Table II. -- Thickness of chromium, nickel, and copper coatings

Base metal and finish	Minimum thickness or significant surfaces: Regular - Grade R	Emergency - Grade E
Chromium plating on brass:		
Copper (optional, not required)	Inch	Inch
Nickel	0.00010	0.00005
Chromium	.00001	.00001
Chromium plating on aluminum or zinc alloy die castings:	(1)	(2)
Copper	.00030	
Nickel (final nickel coating)	.00030	.00015
Nickel plus copper, total	.00075	.00060
Chromium	.00001	.00001

(1)Where the thickness of nickel equals or exceeds the thickness required for nickel plus copper, the copper coating may be omitted.
(2)The copper coating shall conform to the thickness given for nickel plus copper.

3.4.5 Plastics - All plastics used in the refrigerator shall be fungus-resistant, and odor-free, and shall not impart odor or taste to food or water. Plastics shall not craze, crack, or permanently distort, from temperature or load under conditions of normal use or during storage in temperatures ranging from 0°F to 150°F.

3.4.5.1 Styrene plastics

3.4.5.1.1 Definition - As defined tentatively in ASTM Designation D883 styrene plastics are those plastics based on resins made by the polymerization of styrene or copolymerization of styrene with other unsaturated compounds.

3.4.5.1.2 Impact resistance and quality - Styrene plastics used in a refrigerator shall conform to the definition in 3.4.5.1.1 and shall be virgin material except for recleaned sprues and runners from the same molding operation. Where styrene plastic is specified in this specification as an optional material for door liners; breaker strips; interior trays, baffles, special storage vessels; or supports for shelves, trays, baffles, or special storage vessels it shall have an Izod impact resistance of at least 1 ft-lb when tested in accordance with method 1071 in Federal Specification LP 406. Where styrene plastic is used for other components of a refrigerator it shall have an Izod impact resistance of at least 0.25 ft-lb when tested in accordance with the same test method.

3.4.5.2 Polyethylene plastics - Where polyethylene plastic is specified as an optional material in this specification it shall be virgin material except for recleaned sprues and runners from the same molding process, complying with the characteristics of Type I, Grades 2 and 3 in ASTM Specification D1248.

3.4.5.3 Vinyl chloride plastics and synthetic rubbers - Where vinyl chloride plastic or synthetic rubber is specified as an optional material in this specification it shall be virgin material except for recleaned sprues and runners from the same molding process; it shall have a low compression set; and the plasticizer used shall not migrate to enamels or other surfaces with which it is in contact on the refrigerator.

Vinyl chloride plastic shall have a minimum tensile strength of 1100 psi with a minimum elongation at rupture of 250% when tested in accordance with Method 1011 of Federal Specification LP 406; and the weight loss shall not exceed 2-1/2% when heated in accordance with test 6K of ASTM D 744 (in the case of gaskets, the specimen may be a piece of gasket 5 inches long).

3.4.5.4 Thermosetting plastics - When thermosetting plastic is specified as an optional material in this specification it shall be phenolic or melamine plastic; molded parts shall have a flexural strength of not less than 7,500 psi and laminated parts shall have a flexural strength of not less than 10,000 psi when tested in accordance with method 1031 of Federal Specification LP 406; molded parts shall have a maximum water absorption of 0.8% and laminated parts shall have a maximum water absorption of 4% when tested in accordance with method 7031 of Federal Specification LP 406.

3.5 Operating Requirements

3.5.1 No-Load Operation

3.5.1.1 Fixed thermostat setting - The refrigerating unit in all types of refrigerators shall be capable of automatically producing and maintaining an average temperature of 39°F in the general food compartment in an ambient temperature of 90°F for some one setting of the refrigeration control when tested under conditions of 4.3.2 and 4.3.2.1. Without any change in control settings the average general food compartment temperature as defined in 4.3.1.7 shall be 33°F and 43°F for the tests in ambient temperatures of 70°F and 110°F (4.3.2.2 and 4.3.2.3). In type III and IV refrigerators the average temperature in the frozen food storage compartment shall be maintained simultaneously at a control point of 12°F or lower during the three no-load operating tests described in 4.3.2.1 to 4.3.2.3. The difference in temperature between any two thermocouples or thermometers in the general food compartment (not including vegetable drawers or other special purpose vessels) shall not exceed 10°F. The temperature change as determined in 4.3.5.1 caused by the cycling of the refrigeration control shall not exceed 6°F in the general food compartment and 4°F in the frozen food storage compartment during any of the no-load operating tests of 4.3.2. The condensing unit shall not operate more than 90% of the time and shall not cycle on the motor overload protective device during the no-load operating test in an ambient temperature of 110°F (4.3.2.3).

3.5.1.2 Adjustable Temperature Control - The average temperature of the general food compartment shall be adjustable to any desired value in the range from 37°F to 43°F when tested in accordance with 4.3.5.2. The change

in average temperature shall be accomplished by adjustment of the refrigeration control specified in 3.9.3.3.

3.5.2 Ice-Making - The refrigerator shall be capable of simultaneously freezing a weight of water equal to or greater than the ice storage capacity shown in Table I in 6 hours in an ambient temperature of 90°F when tested under conditions described in 4.3.3. Refrigerators with automatic ice-makers shall be capable of producing and storing without attention in 24 hours a weight of ice equal to or greater than twice the ice capacity shown in Table I in an ambient temperature of 90°F.

3.5.3 Defrosting

3.5.3.1 Frozen Food Storage Compartment - A defrosting means is not required for the cooling unit of the frozen food compartment of Type III and IV refrigerators except for the following design. If the moisture from the air in the general food compartment accumulates as frost on the cooling coil of the frozen food compartment such a cooling coil shall be subject to the defrosting requirements set forth in this specification for the general food compartment.

3.5.3.2 Automatically-Initiated Defrosting Systems - Automatically-initiated defrosting systems in all types of refrigerators shall be of such design as to defrost at least once during the defrost test(s) specified in 4.3.4.3 and shall automatically restore the general food compartment temperature to 43°F or lower during the 4-hour recovery period. The refrigerating unit shall not be automatically restored to cooling operation until the cooling unit is completely defrosted and the refrigerator shall be automatically restored to normal operation at any desired preselected temperature following the defrost cycle.

On Type IV refrigerators the defrosting operation shall not raise the average temperature of the frozen food more than 5°F.

On all types of refrigerators with automatically-initiated defrosting systems the average temperature of the general food compartment shall not be raised more than 10°F by the defrosting operation when tested in accordance with 4.3.4.

3.5.3.3 Manually-Initiated Defrosting Systems - Manually-initiated defrosting systems on Type I refrigerators shall be equipped with a control which can be manually set for defrost. When tested in accordance with 4.3.4.1 the cooling unit shall defrost completely and then the control shall automatically restore the refrigerator to at least limited operation.

Type III refrigerators shall be automatically restored to normal operation at any desired preselected temperature following the defrost cycle. When tested in accordance with 4.3.4.2, the refrigerating unit shall not be restored to cooling operation until the cooling unit is completely defrosted and the general food compartment temperature shall automatically be restored to 43°F or lower during the 4-hour recovery period.

Manually-initiated defrosting of Type III refrigerators shall not raise the average temperature of the frozen food more than 5°F nor the average temperature of the general food compartment more than 10°F based on one defrost per 24 hours when tested in accordance with 4.3.4.2.

3.5.4 Exterior Condensation - The refrigerator shall operate without causing exterior condensation visible to the eye or detectable by wiping with the fingers when tested in accordance with 4.3.6.

3.5.5 Motor-overload Protective Device - The compressor-motor-overload protective device shall be of the automatic-reset style. It shall open the electric circuit to the motor before the running winding of the motor reaches a temperature of 302°F. in case of failure of the starting mechanism or in case of excessive overload caused by interruption of the supply of cooling air for the condenser when the refrigerator is operated in accordance with the conditions described in 4.3.7. Windings of fan motors, if used, shall not exceed a temperature of 302°F. under condition of locked rotor in accordance with test procedures of 4.3.7.3.

3.6 Construction - Refrigerators shall be self-contained and completely factory assembled.

Refrigerant systems shall be dried, evacuated, and charged with operating requirements of refrigerant and oil. The refrigerant system, after being charged with refrigerant and oil, shall not contain moisture in excess of 25 p.p.m. as determined by testing a sample of the refrigerant in accordance with the requirements of 4.3.8. Each unit shall be provided with insulated compartment(s), evaporator(s), condensing unit, control devices necessary for automatic operation and protection, and other equipment as required in this specification or specified in the invitation to bid, contract or order, (See 6.1).

Refrigerators shall be so designed that they will not tip forward when the door(s) is/are opened 90 degrees with the door shelves (if furnished) loaded as for the drop test in 4.3.9 and the remainder of the refrigerator empty.

3.7 Modification and Obsolescence - Refrigerators and components thereof furnished under this specification must be new and unused. Refrigerators operated only for tests to determine that they are in satisfactory operating condition or that they will comply with this specification will be considered new. The refrigerators must be the product of a manufacturer who has produced electric refrigerators for at least one year next prior to the date of the invitation to bid, contract, or order. Stock or commercial models modified to meet the requirements of this specification, under the waiver provision (4.4) shall be considered the manufacturer's stock refrigerators, unless the motor-compressor unit, the evaporator(s), the controls, the control system or the cabinet have been modified. Modification of a refrigerator that has been approved for a contract or order shall not be made without prior approval of the modification by the contracting officer.

3.8 Cabinet

3.8.1 Framing - Framing, if used, shall be fabricated of steel, electrically welded, or aluminum alloy, electrically- or gas-welded in an inert atmosphere. Steel or aluminum-alloy used for framing shall be suitably treated to meet

the requirements of 3.4.2.1 with respect to corrosion resistance.

3.8.2 Wood - No wood shall be used for framing in the cabinet construction. Any wood or wood products used for purposes other than framing shall be treated to provide resistance to fungus, rot, and vermin.

3.8.3 Insulation - The refrigerator shall be insulated in such a manner that condensation does not occur on any external surface when tested in accordance with 4.3.6. The insulation shall be of a type that is resistant to fungus, rot and vermin, and shall be so installed as to prevent settling in service. The exterior surfaces of the insulation space shall be vapor-sealed and all insulation spaces shall be filled completely so as to leave no voids.

3.8.4 Exterior Casing, Interior Liner, and Finish

3.8.4.1 Materials - The outer casing and the interior liner of the general food compartment, except the door liner, shall be made of steel, corrosion-resistant aluminum alloy, stainless steel, or corrosion-resistant aluminum alloy and stainless steel in combination. Unless otherwise specified in the invitation-to-bid, contract or order, steel shall be used. Steel or stainless steel sheet used for exterior casings and interior linings of the general food compartment shall have a minimum thickness of 0.025 inch whereas aluminum alloy sheets for the same purpose shall have a minimum thickness of 0.030 inch.

3.8.4.2 Exterior Casing and Finish - The exterior casing of the refrigerator, if of steel, shall be finished in porcelain (vitreous) enamel or baked-on synthetic enamel, or shall be polished stainless steel or aluminum-alloy. Exterior casings finished in porcelain or baked-on synthetic enamel shall be white unless pastel-color(s) is/are specified in the invitation to bid, contract, or order. All refrigerators of the same type and size furnished on a given contract shall be of the same color unless otherwise specified in the invitation to bid, contract, or order.

3.8.4.2.1 Vitreous Finish - Vitreous enamel on metal and vitreous glaze on bisque shall have all coats fused on at a temperature which will give a satisfactory color and which will produce a hard, glossy surface. Vitreous enamel or glaze shall be free from all discolorations, imperfections, chipped spots, fish scale, burn off, crazing, blisters which will mar the appearance of the item or leave the base metal exposed, beads of enamel or glaze, lumps and scumming. Bisque shall be given not less than one coat on each side. When vitreous enamel is applied to sheet enameling steel, the visible exposed finish shall consist of at least one ground coat and one finish coat, and the ground coat shall completely cover both sides of the metal. The finished porcelain enamel shall not exceed 0.018 inch in thickness when measured as specified in 4.3.10.1. The reflectance of white porcelain enamel shall be not less than 75 percent when measured as specified in 4.3.10.2.

3.8.4.2.2 Organic Finish - Organic finish on the exterior surfaces of the cabinet shall consist of baked-on synthetic enamel applied to phosphatized zinc-coated steel or to phosphatized steel and shall have a minimum thickness of 0.002 inch. The interior surfaces of the casing shall be rust-proofed. There shall be no visible corrosion of either the interior or exterior surfaces after four hours exposure to a salt-spray test conducted in accordance with Federal Specification QQ-M-151. The finish shall be durable, smooth, continuous, nonabsorbent and free from all discoloration or imperfections.

3.8.4.3 Interior Liner and Finish - The interior liner of the general food compartment shall be of steel finished in porcelain enamel or shall be of polished stainless steel or aluminum alloy, as specified, and shall be provided with rounded corners which may be easily cleaned. Where porcelain enamel finish is specified, it shall meet the requirements of 3.8.4.2.1 for vitreous finish. In addition, porcelain enamel, used for the interior liner shall pass the test for acid resistance specified in 4.3.10.3. Unless otherwise specified in the invitation to bid, contract, or order white or pastel-colored interior liners for the general food compartment shall be considered equally acceptable and all refrigerators of the same type and size furnished on a given contract shall be of the same color.

3.8.4.4 Interior Liner of Door - The interior liner of the door shall be (a) steel finished in porcelain enamel as specified in 3.8.4.3, (b) stainless steel, (c) corrosion-resistant aluminum alloy, (d) styrene plastic conforming to the requirements of 3.4.5 and 3.4.5.1 or (e) for Type I refrigerators only, laminated melamine or phenolic thermosetting plastic conforming to the requirements of 3.4.5, and 3.4.5.4. Laminated phenolic used for (e) shall have a melamine finish on the side exposed to the interior of the refrigerator. Steel or stainless steel sheet used for door liners shall have a minimum thickness of 0.025 inch. Aluminum alloy sheet used for door liners shall have a minimum thickness of 0.030 inch. Molded styrene liners and laminated thermosetting liners shall have a minimum thickness of 0.060 inch. Styrene sheet material used in forming door liners shall have a minimum thickness before forming of 0.060 inch and the thickness shall not be reduced to less than .045 inch during the forming operation. Styrene and laminated thermosetting plastic door liners shall be supported in a way that prevents fracture, crazing, or permanent distortion as a result of thermal expansion when tested in accordance with 4.3.11. Unless otherwise specified in the invitation to bid, contract or order, white or pastel-colored door liners shall be considered equally acceptable under this specification.

3.8.4.5 Interior Liner of Frozen Food Compartment - The interior liner of the frozen food compartment shall be made of steel finished in porcelain enamel, stainless steel, corrosion-resistant aluminum alloy, corrosion-resistant copper alloy, or galvanized steel coated with not less than 1 ounce of zinc per square foot of steel surface, and shall be provided with rounded corners which can be easily cleaned. Porcelain enamel finish, if used, shall comply with the requirements for the interior liner of the general food compartment specified in 3.8.4.3.

3.8.5 Breaker Strips - Breaker strips shall be provided for exterior door openings. Breaker strips shall be made of a thermoplastic, a thermosetting plastic, natural or synthetic rubber. These materials shall comply with the requirements for plastics in 3.4.5. If a breaker strip is provided for the door opening of the frozen food compartment it shall be made of a thermoplastic, a thermosetting plastic, or natural or synthetic rubber, complying with the requirements for plastics in 3.4.5.

3.8.6 Exterior Doors - Exterior doors shall be of the overlapping type with square or beveled jambs. Outside edges shall be rounded. Each door shall be provided with an effective thermal barrier between exterior and interior surfaces.

Each door shall be equipped with a means for holding it in a closed position with sufficient force to effect the gasket seal required below, and conveniently located handle for opening the door shall be provided suitable for easy operation with one hand. The device for holding the door closed shall be adjustable to compensate for reduction in original gasket thickness of at least 20% or shall be designed to automatically provide sufficient holding force to effect the gasket seal required over a range of gasket thickness at least from 100 to 80% of original gasket height or thickness. Original gasket thickness shall be measured at the free side of the door with the door closure as adjusted by the manufacturer or, if necessary, adjusted to effect the gasket seal required below. Each door shall be equipped with substantial semi-concealed hinges of corrosion-resistant material or material treated to render it corrosion-resistant and which are adjustable as required to compensate on the hinge side of the door for at least 10% reduction in original gasket thickness.

Each door shall be equipped with a replaceable cushion-type formed gasket made of natural or synthetic rubber or vinyl chloride plastic. The material used shall comply with the requirements for plastics in 3.4.5 and 3.4.5.3 and shall have a compression set of less than 20% when tested in the following manner: A one-inch section of the gasket shall be compressed in the direction of normal use to 60% of the original free height in a device described in Method B of ASTM D395 and held for 7 days at 70°F. The free height measured 30 minutes after removal from the test block shall be 80% or more of the original free height. Gaskets shall be fitted so that a single strip of paper of the width and thickness of the new United States paper currency cannot be withdrawn freely without resistance at any gasket contact when the door with gasket is normally closed.

Doors shall swing to the right or left as specified in the invitation to bid, contract or order. A right-hand swing shall be described as having hinges located on the right side of door when facing the refrigerator.

3.8.7 Shelving - The general food compartment shall be equipped with shelves of the wire-or-bar-type except that the shelf over the vegetable drawers or crispers may be of glass. Wire-or-bar-type shelves shall be made of passivated stainless steel; anodized aluminum alloy steel plated with copper, nickel, and chromium; or steel, electroplated or hot-dipped in zinc and covered with baked lacquer.

Anodized aluminum alloy and zinc-coated steel used for shelving shall not exhibit more than 3 visible spots of attack in 12 sq. in. of shelf area after 24 hours exposure in a salt-spray test conducted in accordance with Federal Specification QQ-M-151.

For sliding shelves the cabinet shall be equipped with stops that prevent unintentional complete withdrawal of the shelf from the refrigerator and contact damage to the liner when the shelf is pushed into the cabinet.

3.8.8 Supports for Interior Shelves, Trays, Baffles and Special Storage Vessels - Supports for shelves, trays, baffles, and special storage vessels shall be made of brass plated with tin, nickel or chrominum; stainless steel; corrosion-resistant aluminum alloy; or plastic. The weight, strength and manner of attachment of of all supports shall be such that they will not crack, craze, become permanently distorted, or become loosened when subjected to the drop test specified in 4.3.9.

3.8.9 Ice-Cube Trays and Grids - Each refrigerator shall be provided with a set of ice-cube trays and grids having a minimum ice capacity as specified in Table I. Ice-cube trays shall be made of corrosion-resistant aluminum alloy or stainless steel. Ice-cube grids shall be made of corrosion-resistant aluminum alloy, stainless steel, or polyethylene plastic having the characteristics specified in 3.4.5 and 3.4.5.2. Ice-cube trays and grids shall be of such design that the cubes may be readily removed from the tray without the use of external heat.

3.8.10 Interior Trays, Baffles and Special Storage Vessels - Each refrigerator shall be equipped with a drip tray suitable for collecting and holding the defrost water or for conveying it to a drainage system within the refrigerator. The drip tray and any other interior trays, baffles, or special storage

vessels furnished with the refrigerator, shall be constructed of glass, stainless steel, steel finished in porcelain enamel, corrosion-resistant aluminum alloy, styrene plastic, or polyethylene plastic and shall be readily removable for cleaning. hen stainless steel finish is specified for exterior and interior liners, all trays, baffles and special purpose vessels shall be of stainless steel. Plastic drip trays shall conform to the requirements of 3.4.5 and to either 3.4.5.1 or 3.4.5.2 whichever is applicable. Other interior trays, baffles, or special storage vessels of plastic shall conform to the requirements of 3.4.5. None of the trays, baffles, and special storage vessels shall be crazed, cracked, or permanently distorted as the result of the drop test performed on the complete refrigerator as specified in 4.3.9.

3.8.11 Defrost Water - Defrost water shall be collected in a readily cleanable, readily removable vessel, or shall be carried out of the cabinet to evaporating apparatus. Adequate baffling shall be provided to prevent defrost water from dropping on stored food in the refrigerator. The volume of the vessel used to collect defrost water shall not be included in computing the total food storage volume in refrigerators with automatically-initiated defrosting systems. Tubes, pipes, baffles, etc., used to collect or carry defrost water shall have corrosion-resistant surfaces, shall be readily removable for cleaning and a trap shall be provided in the line, if used, in which defrost water is carried out of the refrigerator cabinet.

3.8.12 Lighting - Each refrigerator shall be provided with interior illumination for the general food compartment. A switch for lights shall be operated automatically by opening of door except that when multiple doors are supplied, a single-pole tumbler-type switch with integral red pilot light may be provided in the front outside of the cabinet in lieu of automatic switch(s) responsive to the opening of either door.

3.9 Refrigerating System

3.9.1 Cooling Unit - The cooling unit for sizes 7 to 11 inclusive shall be designed for gravity circulation of air in the refrigerator whereas sizes 12 and larger may be designed for either gravity or forced-circulation of air in the general food compartment.

3.9.1.1 Forced-Circulation Type - The forced-circulation type cooling unit shall consist of cooling coil, fan with motor, and housing.

3.9.1.1.1 Cooling Coil - The cooling coil shall be finned tube construction using aluminum tubes with aluminum fins or copper tubes with either copper or aluminum fins. Fins shall be spaced not more than 9 fins per inch. The copper coil shall be tin-plated. Where copper coil with copper fins is used the entire coil assembly shall be hot-tin-dipped after fabrication. Where aluminum fins are used, fins shall be mechanically bonded to the coil tubing. Fittings and joints shall be brazed or silver soldered.

3.9.1.1.2 Fan - The fan and hub shall be made of brass (electro-tin-plated), aluminum alloy, stainless steel, galvanized steel, hard rubber, or plastic. Fan and motor shall be direct-connected.

3.9.1.1.3 Housing - The coil housing, grilled openings, and fan shroud, if used, shall be constructed of corrosing-resisting steel, aluminum alloy, porcelain-enameled steel, steel treated for corrosion resistance, or plastic.

3.9.1.2 Gravity Cooling Unit - Gravity-type cooling units for the general food compartment and frozen food storage compartment shall be made of corrosion resisting steel; brass or copper plated with tin, nickel, or chromium; aluminum alloy; or galvanized steel, coated with not less than 1 ounce of zinc per square foot of steel surface.

3.9.2 Refrigerant Circuit - Unless otherwise specified in the invitation to bid, contract or order, the refrigerant circuit shall be hermetic, thermally or mechanically sealed. All refrigerant-containing components shall be securely supported to minimize strain and vibration. A thermally-sealed hermetic system shall consist of a compressor and motor enclosed in a welded or brazed shell and connected within a refrigerant circuit wherein all refrigerant liquid or gas containing parts shall be sealed to an extent that the circuit cannot be opened without cutting or melting. A mechanically sealed hermetic system shall contain a motor-compressor assembly enclosed either in (a) a welded or a brazed shell or in (b) a gastight shell with mechanical fastenings such as bolts or screws. In either type of mechanically sealed hermetic system the cabinet and frame shall be so designed that the motor-compressor assembly can

be readily removed for replacement or repair. Flared or other compression-type fittings shall be limited to not more than four readily-accessible joints at the motor-compressor assembly. All other joints shall be such that they cannot be opened without cutting or melting. A charging connection and valve, and a dehydrator shall be incorporated in the system.

3.9.3 Condensing Unit - The condensing unit shall be of the air-cooled type, and shall consist of motor, compressor, condenser, control, and other necessary equipment.

3.9.3.1 Compressor - The compressor shall be properly balanced and suitable for the refrigerant employed. The oiling of all moving compressor parts shall be accomplished automatically with provision for returning oil from suction lines to housing or crankcase. The speed of the compressor shall not exceed compressor manufacturer's published recommended speed for the intended service. Evidence shall be provided that the selected speed has received field service for a period of at least one year other than experimental field service.

3.9.3.2 Air-Cooled Condenser - Air-cooled condensers shall be constructed of brass, copper, or steel, hot-tin-dipped or otherwise suitably protected on the outside after fabrication to resist corrosion. Fins, where used, shall be soldered, welded, or mechanically bonded to the tubing to insure permanent contact. Where the exterior casing of the refrigerator or the metal surfaces of a duct at the back of the refrigerator is used as extended condenser cooling surface the condenser tubes shall be securely bonded to the extended surface by mechanical or other means.

3.9.3.3 Refrigeration control - The refrigeration control shall be a temperature control switch actuating the compressor motor. The temperature control shall be adjustable in a range that permits control of the general food compartment temperature at any desired value from 37°F to 43°F when tested in accordance with 4.3.5.2. The differential of the temperature control shall be such that the temperature changes in the general food compartment and frozen food storage compartment caused by cycling of the thermostat do not exceed the limits specified in 3.5.1.1 during no-load operation. The temperature control shall be readily

accessible for adjustment and servicing.

3.9.4 Refrigerant - The refrigerant in the hermetic compressor circuit shall be one of the following refrigerants:

Dichlorodifluoromethane	$CC\ell_2F_2$
Monochlorodifluoromethane	$CH\ C\ell\ F_2$

3.10 Motor and Control

3.10.1 Motors - Motors enclosed with compressors in gas-tight shells, shaded-pole motors, and direct-current motors and all control equipment shall be constructed in accordance with or equal to the best commercial practice in effect on date of invitation for bids. All other alternating-current motors of fractional-horse-power size shall comply with Federal Specification CC-M-636. All motors and electrical equipment shall be suitable for the voltage and currents specified in the invitation to bid, contract, or order. A transformer may be used for voltage adjustment on hermetic systems for voltages other than 110 to 125 volts provided the combination of transformer and other equipment meet all the requirements of this specification. All wiring shall be protected from contact with oil or water in service, or shall be oil and water resistant.

3.10.2 Motor Overlaod Protective Device - Compressor motor shall be protected in case of failure of the starting mechanism, failure of the condensing medium, or excessive overload by an overcurrent or thermal protective device of the automatic reset type. The device shall perform in accordance with the requirements of 3.5.5. Fuses are not acceptable in lieu of this thermal-overload protective device. The starting mechanism shall be simple in design and rugged in construction. Motor controllers shall be provided where required.

3.10.3 Defrosting Heater - Electric heaters for defrosting, if used, shall be so constructed and installed that the user cannot come in contact with heated surfaces at a temperature above 130F at any time during the defrost cycle during normal use of the refrigerator. The electric heaters

shall be so constructed and installed that neither the frost accumulation, the defrost water, or the food load can cause an electric short to develop between the defrost heaters and any metallic component inside the cabinet. The interior liner and any cooling units that are defrosted by electric heaters shall be adequately grounded to prevent hazard of electric shock to the user. No terminals shall be located so as to permit accidental contact by the user during normal use. Electric heaters used for defrosting shall not exceed 1500 watts capacity.

3.10.4 Wiring and Accessories - All refrigerators shall be completely electrically wired. All refrigerators having electrical equipment wound for 250 volts or less shall be equipped with an electric cord. The cord shall have an attachment plug and shall extend at least 5 feet, but not more than 9 feet, beyond the cabinet. The cord shall be protected to prevent abrasion at the entrance to the cabinet and shall be provided with adequate strain relief. For electrical equipment wound for voltages over 250, suitably enclosed terminal blocks shall be provided for connection to external circuits, unless otherwise specified.

3.11 Fire and Casualty Hazards

3.11.1 Underwriters' Laboratories Standards - The contractor shall submit to the purchasing agency proof that the commodity he furnishes under this specification conforms to the Standard for Unit Refrigerating Systems of the Underwriters' Laboratories, Inc., regarding fire and casualty hazards in every detail except those in which requirements of this specification are different from those of the above Standard. The label, marker, listing or certified report of the Underwriters' Laboratories, Inc., will be accepted as evidence of compliance with this requirement.

3.11.1.1 Data From Other Laboratories - In lieu of Underwriters' Laboratories evidence, the contractor may submit evidence from other sources that his commodity conforms to the Standard for Unit Refrigerating Systems of the Underwriters' Laboratories, Inc., of the issue in effect on the date of invitation for bids.

3.11.1.2 Precedence of Specification Requirements - Compliance with Underwriters' Laboratories requirements regarding fire and casualty hazards does not absolve the con-

tractor from complete compliance with the requirements of this specification in order to secure the acceptance of his commodity. In event of difference between any of the requirements of this specification and those of Underwriters' Laboratories, Inc., the requirements of this specification shall govern.

3.12 Instructions for Care and Operation - The contractor shall furnish complete instructions for maintenance and operation with each refrigerator, including complete lists of replacement parts or assemblies, indicating manufacturer, and manufacturer's part numbers with contractor's corresponding part numbers for dual identification.

3.13 Nameplate and Other Data.

3.13.1 Nameplate Data - The following shall be marked on suitable name plate or name plates:

(1) Name of the organization sponsoring the completely assembled refrigerator.

(2) Manufacturer's type number, model or catalog number, and serial number.

(3) Voltage and kind of current; if alternating current, the frequency and phases; if dual voltage, a connection diagram for changing voltage shall be shown.

(4) The refrigerant used, expressed in chemical or other descriptive terms, and amount of refrigerant required to the nearest 1/4 pound.

(5) Factory test pressure of refrigerant system.

3.13.2 Component-parts Data - Compressors, controls, motors, cabinets, etc. shall bear the name of the manufacturer (if different from the organization sponsoring the completely assembled cooler) and sufficient additional information for replacement of parts or servicing.

3.13.3 Warning plates - Warning plates, if applicable, shall be conspicuously mounted.

4. Sampling, Inspection and Test Procedures.

4.1 Manufacturer's Routine Inspection and Test - It shall be

the responsibility of the manufacturer to supply refrigerators under contract that are in compliance with all requirements of the specification. To assure that production quality is maintained all refrigerators on each contract shall, as a routine procedure, be inspected by the manufacturer for fit, materials, finish, and general conformity with the requirements of this specification.

Routine inspections are only intended for determination of general conformity with the requirements of the specification that can be checked during assembly and by visual observation after completion of the refrigerators. Routine tests need not necessarily follow the test procedures of 4.3 of this specification.

4.1.1 Refrigerant Working Pressure - The refrigerant-containing system of each refrigerator to be furnished on the contract shall not be damaged or leak when tested at the pressures listed in Table III for the refrigerant used.

Table III - Working Test Pressure

Refrigerant	Test pressure, minimum	
	High-pressure side	Low-pressure side
Dichlorodifluoromethane, CCl_2F_2	p.s.i.g. 235	p.s.i.g. 140
Monochlorodifluoromethane, $CHClF_2$	385	235

4.2 Purchaser's Inspection and Tests

4.2.1 Routine Production Inspections and Tests - Purchaser's routine inspection of refrigerators to determine the quality control of manufacturing and assembly processes shall be done at the manufacturer's plant in the presence of a representative of the purchaser before, during, or after production is completed but before the refrigerators are approved for shipment by the purchaser or his representative

The extent of purchaser's inspection and method of sampling for routine inspection shall be established by the purchaser.

Purchaser's routine tests shall also be made at the manufacturer's plant. The representative of the purchaser may use the manufacturer's routine tests described in 4.1 to evaluate the performance of the refrigerators to be furnished under contract if these tests are performed in his presence or if satisfactory records of the results of these tests are available. Otherwise, one of each fifty refrigerators or fraction thereof of each voltage, type, and size offered for delivery shall be selected by the purchaser's representative and tested in his presence for compliance with the operating requirements of paragraphs 3.5.1 through 3.5.5. All labor, equipment and apparatus required for the production inspection and tests shall be supplied by the manufacturer or contractor.

4.2.2 Acceptance Inspection and Tests - Unless otherwise specified in the invitation to bid, contract, or order, one refrigerator of each type, size, and power supply shall be tested to determine compliance with all construction and performance requirements of the specification, invitation to bid, contract or order. Performance tests shall be conducted in accordance with 4.3.1 through 4.3.11. Acceptance inspections and tests shall be conducted at the manufacturer's works or at a Government laboratory as specified in the invitation to bid, contract, or order. All labor, equipment and apparatus required to conduct the acceptance tests and inspections shall be supplied by the contractor when tests are conducted at his works or at another laboratory approved by the purchaser when no testing facilities are available at the manufacturer's works. If the tests and inspections are conducted at a Government Laboratory, the Government shall supply the necessary labor, equipment, and apparatus. In the event a refrigerator under test fails to meet the requirements of this specification, the contractor may, at his request, and at no cost to the Government, submit two additional refrigerators or resubmit the original refrigerator readjusted or repaired for further tests. No more than two resubmissions of readjusted or repaired refrigerators will be permitted. Failure of three specimens shall constitute non-compliance with this specification.

In addition, the purchaser shall have the right to

perform acceptance inspections and tests, at the purchaser's cost, on any or all refrigerators offered for delivery or delivered under contract. The Government shall notify the contractor promptly of such additional acceptance tests. Failure of such refrigerators to meet specification requirements with exceptions as noted in bid may result in cancellation or adjustment of the contract and/or return of refrigerators delivered under the contract.

All test specimens which do not meet specification requirements with exceptions as noted in bid, shall, at the purchaser's option, be returned to the contractor and, if returned, shall not be accepted for delivery under contract.

When acceptance tests are conducted at a Government laboratory, the scheduled delivery date(s) shall be adjusted by the purchaser to compensate for the time required for such testing.

4.3 Performance Tests

4.3.1 Conditions of Test - The conditions of test described in 4.3.1.1 to 4.3.1.9 apply to tests specified in 4.3.2 through 4.3.7.

4.3.1.1 Test Specimen - The cabinet and refrigerating mechanism shall be assembled and set up exactly as they would be installed in service and as nearly as practicable in accordance with the intentions of the manufacturer so far as stated or known. Ice trays and drip trays shall be in their proper places during all tests. Containers and covers, and food shelves shall not be removed.

4.3.1.2 Run-In - Before starting the first performance test the refrigerator shall be given a "run-in" period of not less than 24 hours. The "run-in" shall be made at room temperature with the temperature control set at the coldest position and the door(s) shall be closed.

4.3.1.3 Length of Test - In preparation for any operating test the refrigerator shall be operated under specified test conditions for a sufficient length of time to establish steady or repetitive state. Immediately after this preliminary period the refrigerator shall be operated for the specified test period during which the desired elements of performance are determined by observation or measurement.

4.3.1.4 Power Supply - Unless otherwise specified in the invitation to bid, contract, or order, standard conditions of electric power supply for test purposes shall be 115V ±2 volts at nominal 60 cycles. The characteristics of the actual power supply used for tests shall be reported.

4.3.1.5 Mounting of Test Specimen - In all operating tests each refrigerator shall be placed on a separate solid-top platform with all sides open for free air circulation under the platform. The top of the platform shall be 1 foot above the normal room floor and shall extend at least 1 foot, but not more than 2 feet, beyond each side of the refrigerator.

Circulation of air about the refrigerator under test shall be restricted by vertical partitions. A rear partition shall be placed adjacent to spacers, if provided at the rear of the cabinet, but not less than 2-1/2 inches from the rear wall of the cabinet. Vertical side partitions shall extend 1 foot forward from the rear partition and shall be placed 1 foot from the sides of the cabinet. The partitions shall extend vertically from the platform to a point not less than 1 foot above the top of the cabinet or unit, whichever may be higher.

The refrigerator and partitions shall be placed far enough away from all other objects in the hot room to eliminate the danger of any partition being at a temperature other than the ambient.

The refrigerator shall be so placed or shielded as to prevent direct radiation to or from the space-cooling or -heating equipment, and windows in the test room shall be provided with suitable radiation shields.

Air circulation in the room shall be such that the specified uniformity of temperature distribution is obtained. The refrigerator under test shall be shielded from forced-air currents with a velocity above 50 feet per minute.

4.3.1.6 Ambient Temperature - Ambient temperatures shall be measured at points located 3 ft. above the platform and 10 inches from the

middle of each side and the front of the cabinet. Ambient temperature at each point shall be maintained within ±1 F of the specified values. This condition shall be maintained during stabilization periods, as well as during actual test runs.

The ambient temperature shall be measured with thermocouples, resistance thermometers, or glass thermometers.

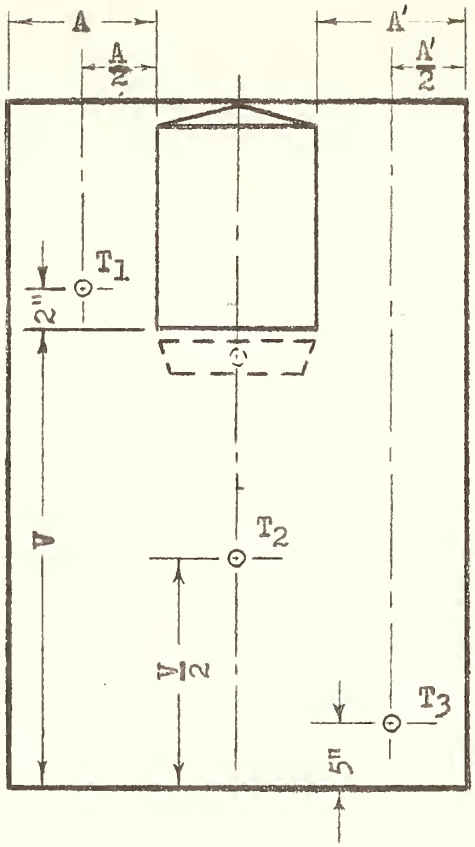
The temperature-sensitive part of the temperature-measuring device shall possess, or shall be in good thermal contact with, a metallic mass such as to bring about a total heat capacity not less than 10 or more than that of 20 grams of water.

The temperature gradient in any foot of vertical distance from the platform to a height of 7 feet shall not exceed 0.5 F per foot.

4.3.1.7 General Food Compartment Temperature.--The general food compartment temperature shall be the average of three temperatures observed at points designated as T_1, T_2 and T_3 in Figures 1 through 5. These temperature measurements shall be taken midway between front and back of food storage space. In case of interference, the temperature measurements may be taken not more than 1 inch from the indicated positions. If the interior arrangements of refrigerators do not conform with those shown in Figures 1 through 5, temperature measurements shall be taken as nearly as possible with the intent of this specification and these locations reported.

Temperature of air in special purpose vessels (for general food storage) such as are indicated in Figures 1 through 5, shall be made as near as possible to the center of the vessel.

Internal temperatures, other than frozen food compartment(s), shall be taken either with thermocouples or with resistance thermometers. Each thermocouple or temperature-sensitive element of a resistance thermometer shall possess, or shall be in good thermal contact with, a metallic mass such as to bring about a total heat capacity of not less than 10 or more than 20 grams of water, and shall be supported in such a manner that there will be at least 1/2 inch of air space separating the thermal mass from direct contact with heat-conducting



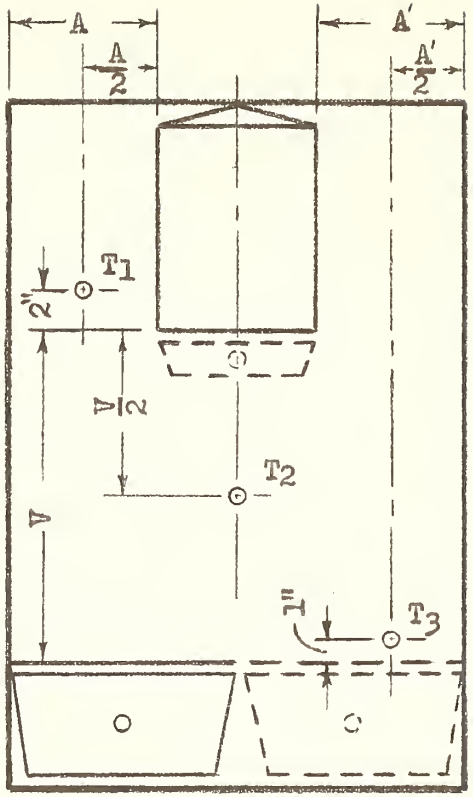
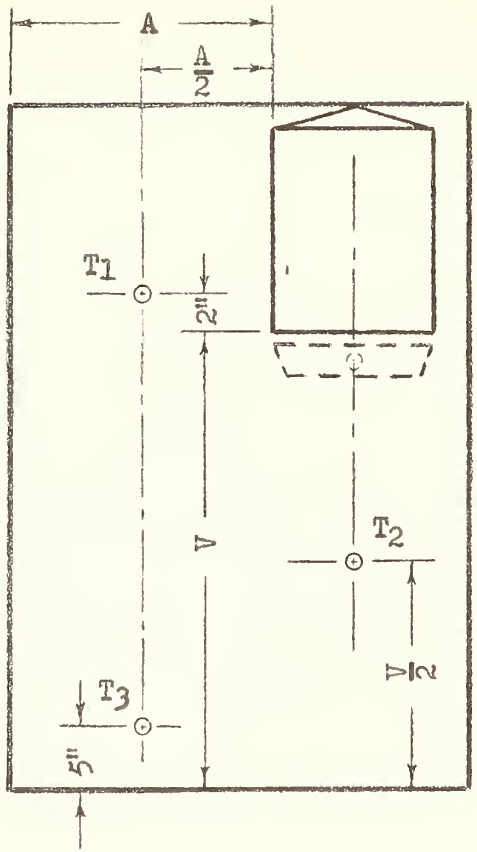


Fig. 1



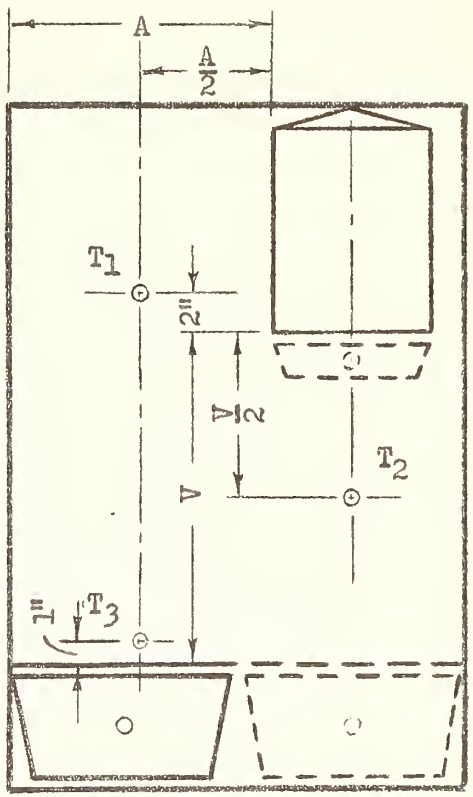


Fig. 2

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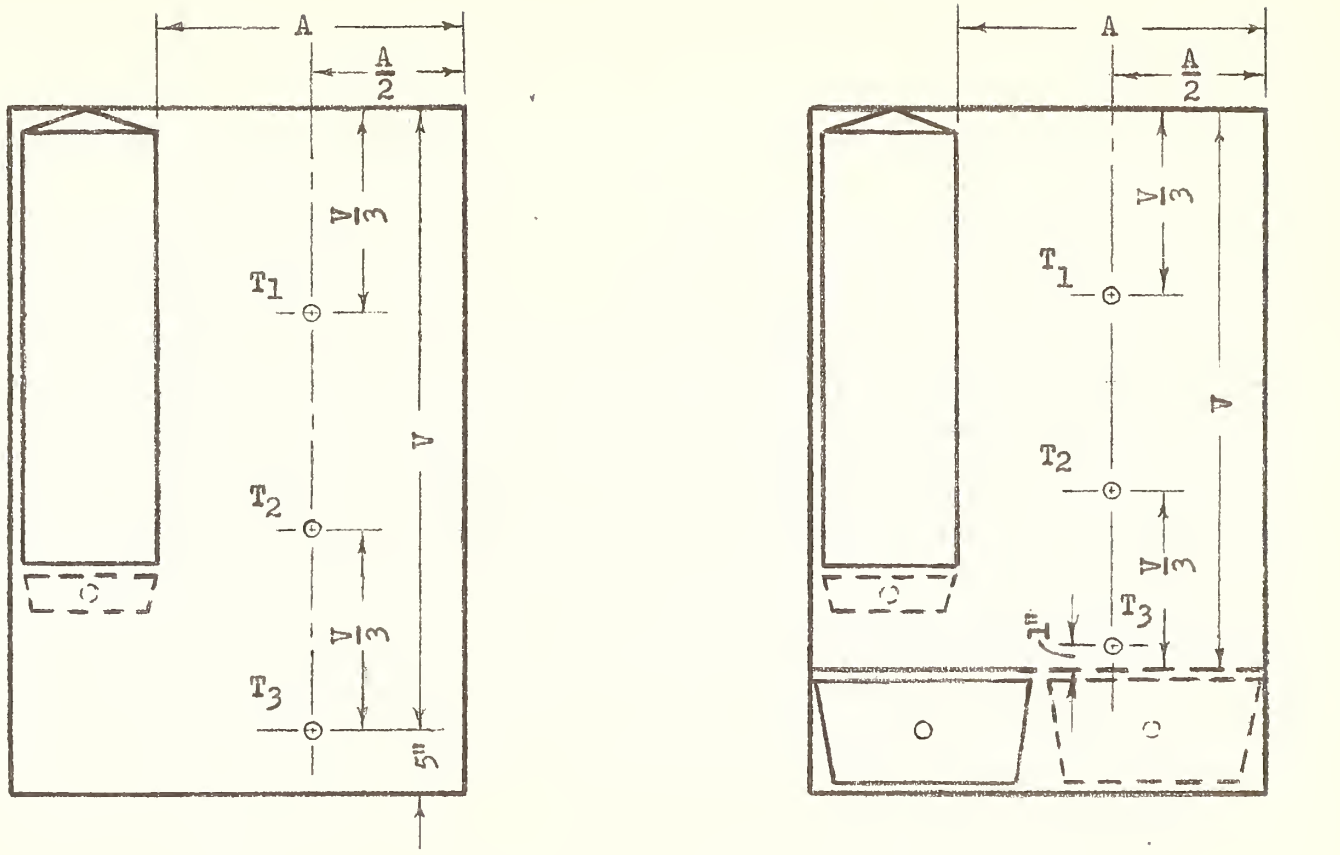


Fig. 3

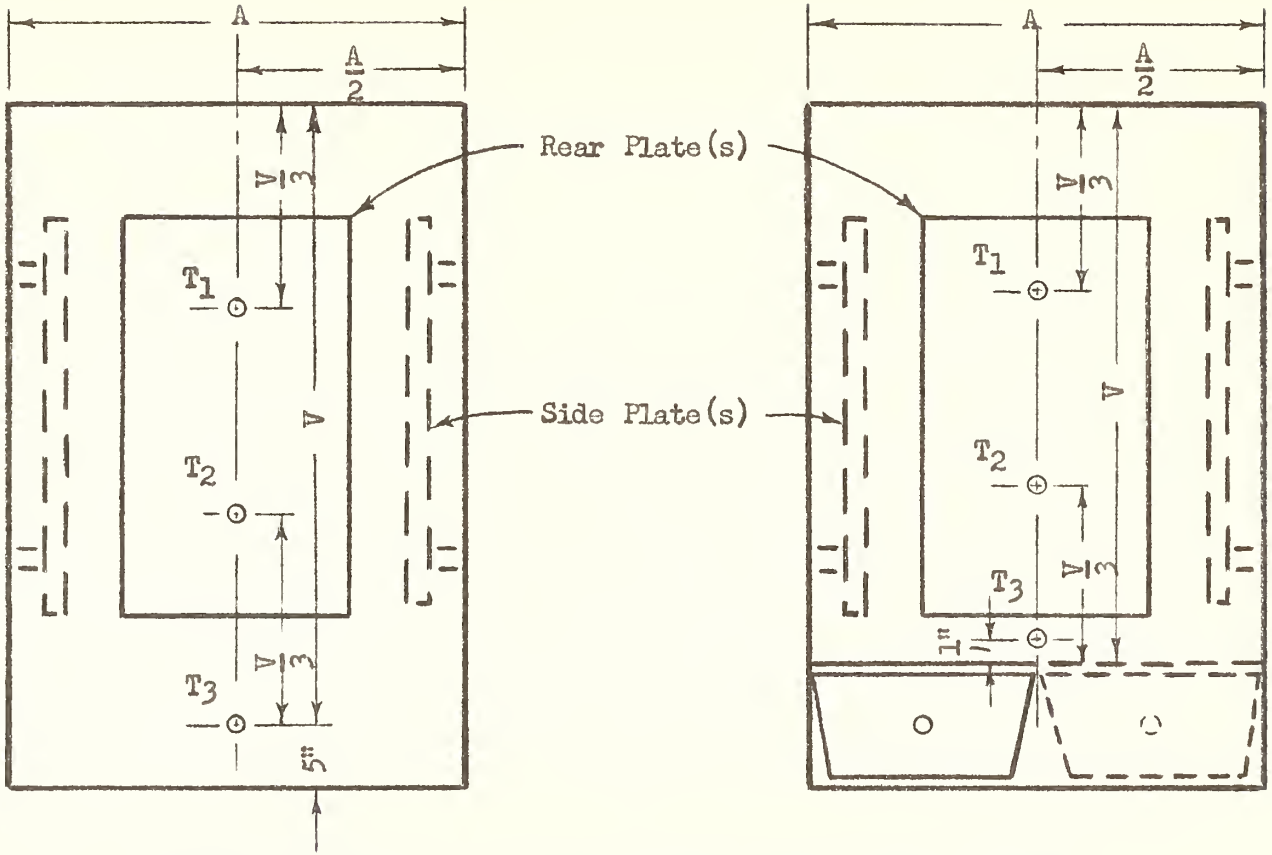
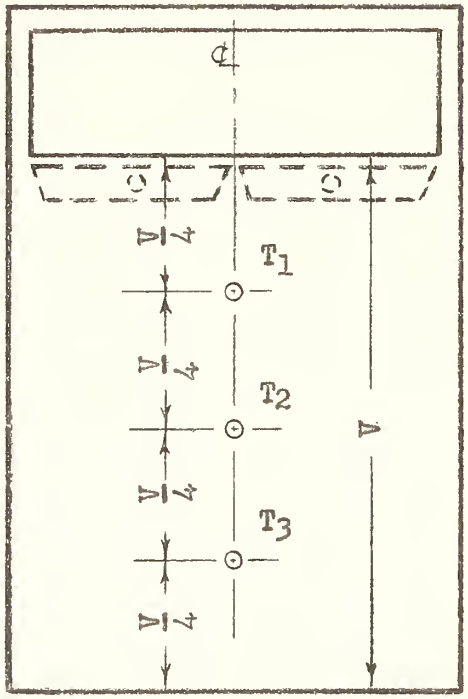

A
A/2
A/3
A
T1
T2
T3
5"
Rear Plate(s)
Side Plate(s)
Refrigerated wall, or vertical plate type cooling surface

Fig. 4



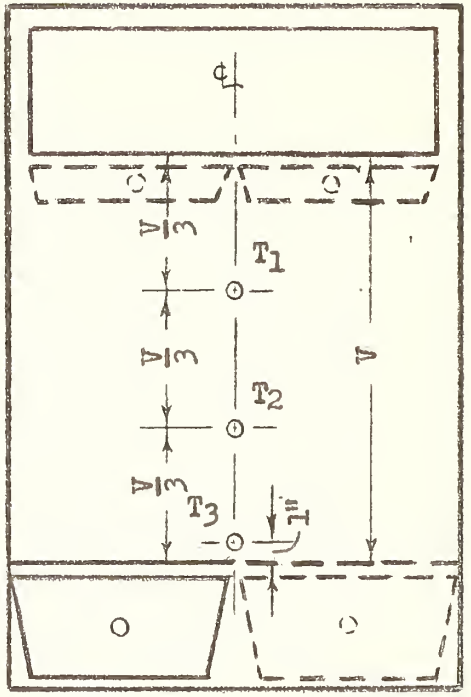


Fig. 5

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surfaces in the refrigerator. Leads from temperature-measuring devices shall be brought outside of the cabinet in such a manner as to interfere as little as possible with air seals.

4.3.1.8 Temperature of Frozen Food Storage Compartment(s).--The temperature of each frozen food storage compartment shall be the average of readings of 3 or 4 thermocouples each embedded in the geometrical center of simulated frozen food packages placed in each compartment, in accordance with Figure 6. When more than one compartment is provided the results for each compartment shall be reported separately. The average frozen food storage compartment temperature shall be the arithmetical mean of the temperatures given by the installed thermocouples. The frozen food storage compartment(s) under test shall be loaded with packages of simulated frozen food which shall practically fill the compartment(s) and shall be spaced and distributed in accordance with Figure 6.

Sealed cardboard freezer packages approximately 4" x 3-5/8" x 2" shall be used and shall contain a liner or wrapper that makes them moisture and vapor proof. The packages shall be filled to an overall package density of 35 pounds per cubic foot with saturated hardwood sawdust soaked for 3 days in an aqueous solution of sodium chloride with a specific gravity of 1.02 at 70°F.

4.3.1.9 Recording of Data.--Temperatures shall be recorded graphically by instrument, photographically, or observed and recorded by an operator, at intervals as specified under 4.3.2 through 4.3.7. Temperature measurements shall be accurate to 0.5F.

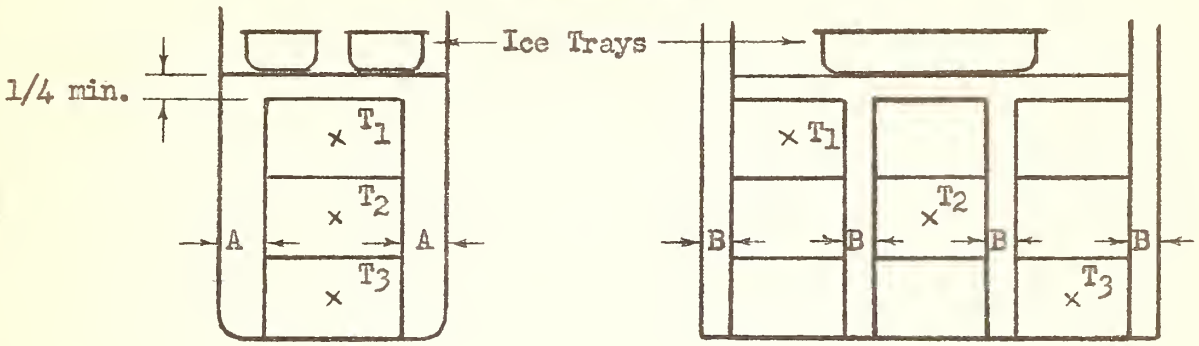
The operating time of the unit, where required, shall be obtained by means of a synchronous, self-starting electric clock or a similar time-integrator.

4.3.2 No-Load Operating Tests.--The no-load operating test shall be conducted in three parts (4.3.2.1 through 4.3.2.3), in ambient temperatures of 90°F, 70°F and 110°F respectively, under general conditions of 4.3. For these tests the ice cube trays shall be in place for all types of refrigerators and shall contain a charge of ice not less than that specified in Table I. In addition, Type III and IV refrigerators shall contain a full charge of simulated

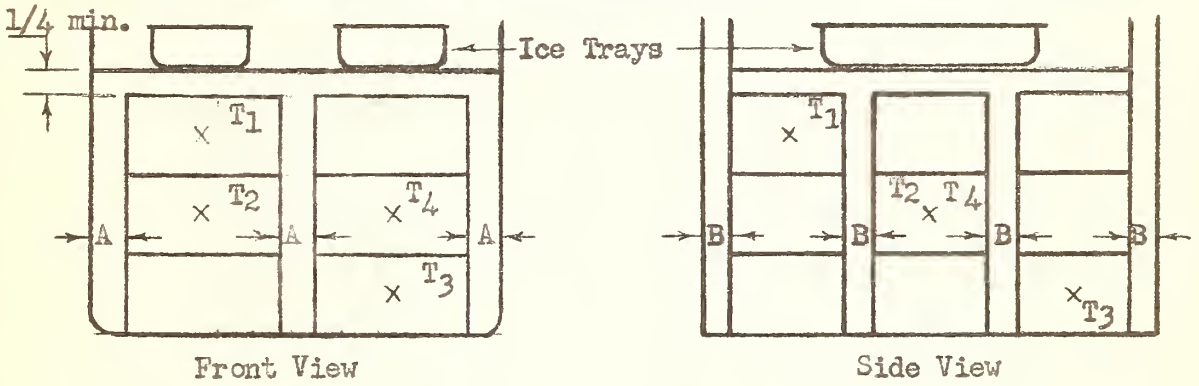
HOUSEHOLD AUTOMATIC ELECTRIC REFRIGERATORS (MECHANICALLY OPERATED)

THERMOCOUPLE LOCATIONS FOR DETERMINATION OF FROZEN FOOD STORAGE COMPARTMENT TEMPERATURES

Note : use pint package = 4 x 3 5/8 x 2

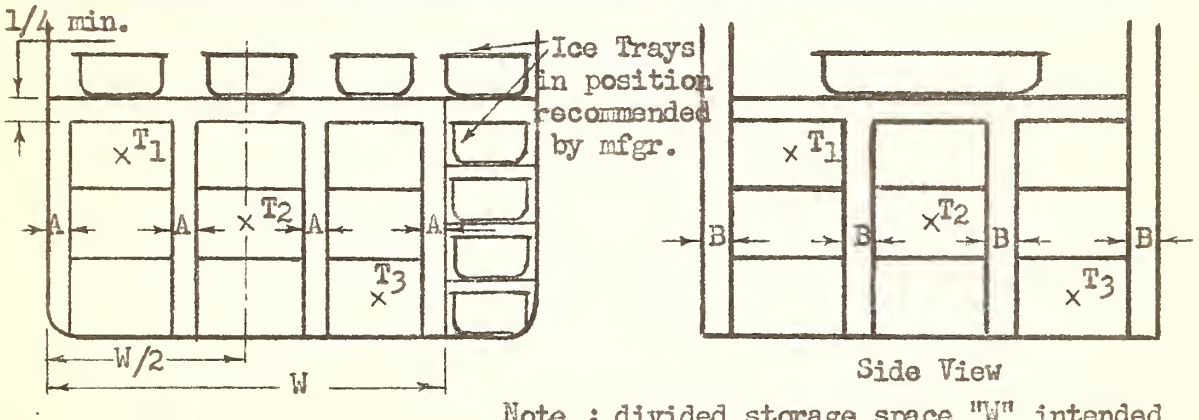


VERTICAL FROZEN FOOD STORAGE COMPARTMENT (Width less than 8 inches)



Note : if one side of compartment is not refrigerated T_1 is to be located adjacent to that side.

VERTICAL FROZEN FOOD STORAGE COMPARTMENT (Width greater than 8 inches)



Note : divided storage space "W" intended for frozen food storage as shown

FULL WIDTH FROZEN FOOD STORAGE COMPARTMENT

NBS

Note : loading of packages shall be distributed to provide equal spacings "A" (across width of compt.) or "B" (from front to back).

Fig. 6

frozen food as outlined in 4.3.1.8.

Data to be recorded shall include:
Ambient temperature (4.3.1.6)
General Food Compartment Temperature (4.3.1.7)
Frozen Food Storage Compartment Temperature(s) (4.3.1.8)
Temperature (s) in special purpose vessels (4.3.1.7)
Temperature control position
Percent operating time (4.3.1.9)

In preparation for each of the three no-load operating tests, the thermostat shall be set at the position determined by the procedure outlined in 4.3.2.1. Prior to each no-load operating test, the refrigerator shall be completely defrosted and dried. The ice-cube trays filled as required with water or ice shall then be placed in normal position, and, for types III and IV refrigerators, the required simulated frozen food, preferably prefrozen, shall be placed in the frozen food storage compartment(s). The refrigerator shall then be operated for a stabilizing period of at least 6 hours at test conditions after the ice charge is frozen, the average general food compartment temperature has indicated repetitive values within 0.5 F for two thermostat cycles, and, for types III and IV, the average frozen food temperature has also indicated repetitive values within 0.5 F for two thermostat cycles.

Each test shall commence without interruption at the end of the stabilizing period, shall be continued for a period of at least 12 hours and shall cover an equal number of off-periods and on-periods of compressor operation. Refrigerator door(s) shall not be opened during the stabilizing period or test period.

Refrigerators shall, if practical, be operated without any defrosting during the no-load operating tests. Refrigerators with automatically-initiated defrosting means may be defrosted, if it is not feasible to prevent defrosting or, if the average general food compartment temperature would be adversely affected by preventing the defrost. If defrosting is permitted the temperatures observed during defrosting shall be included in the overall average for the no-load operating test.

Temperature observations shall be made continuously or at equal intervals not greater than 15 minutes. Reported temperatures shall be the arithmetic average of all readings taken at equal time intervals.

4.3.2.1 No-Load Operation at 90°F Ambient Temperature.--The first no-load operating test shall be conducted at 90°F ambient temperature. In preparation for this test the temperature control shall be set to control the average general food compartment temperature at 39°F ±1°F based on the arithmetic average of readings taken at 5 minute intervals for at least two complete cycles or for at least one hour whichever is the longer after repetitive temperature conditions have been observed for at least two complete cycles. Normal ice and frozen food loads shall be in position when thermostat setting is determined.

4.3.2.2 No-Load Operation at 70°F Ambient Temperature.--The second no-load operating test shall be conducted at 70°F ambient temperature. The temperature control shall be set at the same position as for the test at 90°F ambient temperature.

4.3.2.3 No-Load Operation at 110°F Ambient Temperature.--The final no-load operating test shall be conducted at 110°F ambient temperature. The temperature control shall be set at the same position as for the test at 90°F ambient temperature.

4.3.3 Ice-Making Test. (See 3.5.2)--The refrigerator shall be set up under the general conditions of 4.3.1 with the ambient temperature controlled at 90°F ±2F. The general food compartment and the frozen food storage compartment shall be empty except for the ice trays.

4.3.3.1 Preliminary Operation.--In preparation for the ice-making test the refrigerator shall be operated for a period of eight (8) hours with the temperature control set to maintain an average general food compartment temperature of 39°F ±1F as described in 4.3.2.1. The ice trays shall be left out of the refrigerator during this preliminary period. The evaporator shall be free from frost and the interior of the cabinet shall be dry at the beginning of the 8-hour preliminary period of operation.

4.3.3.2 Ice Tray Loading.--At the end of the 8-hour pre-

liminary period each ice tray shall be filled with water at 90°F ±2F to a level 1/8-inch from the top with the grids in place and the weight of water determined. Enough trays shall be used to hold a weight of water equal to or greater than the minimum ice capacity shown in Table I. The ice trays shall be inserted quickly into the ice-making compartment in their normal locations, after wetting the surfaces of the cooling unit on which the trays rest to insure good heat transfer.

4.3.3.3 Freezing period.--After inserting the ice trays in the refrigerator the temperature control shall be set at the coldest setting that permits cyclic operation (not shunted) and left at this setting during the 6-hour test period. The door shall be left closed during the entire 6-hour test. Six hours after closing the door at the beginning of the test the ice trays shall be removed and inspected to determine whether or not all of the charge has been frozen.

4.3.4 Defrost Test.--The refrigerator shall be operated under the general conditions of 4.3.1. The test room shall be maintained at a temperature of 90°F ±2°F and a relative humidity between 80 and 85%. The temperature control shall be set to control the general food compartment at 39°F ±1°F as specified in 4.3.2.1. The refrigerator shall contain the required ice charge and Type III and IV refrigerators shall be loaded with simulated frozen food as specified in 4.3.1.8.

4.3.4.1 Type I, Manually-initiated Defrost.--The refrigerator shall be defrosted and the evaporator and cabinet interior wiped dry. With ice or water in the ice cube trays the refrigerator shall be placed in operation and observed until the water is frozen and repetitive temperatures of the general food compartment have occurred for at least two thermostat cycles as indicated by temperature observations taken at equal intervals not greater than 15 minutes. Beginning at this time a frost accumulation period shall be started. For 20 hours the refrigerator door shall be opened wide for a period of 30 seconds 4 times at the beginning of each hour at 5 minute intervals, for a total of 80 door openings in the 20 hour period. Temperature observations of the general food compartment shall be made at equal intervals not greater than 30 minutes one of which shall be made just prior to the first door opening each hour. At the end of the twentieth hour

the refrigerator shall be defrosted, with the door closed and ice trays in place, by manually setting the temperature control in the defrost position. During the defrost cycle and the operating period following, temperature observations of the general food compartment shall be made at equal intervals not greater than 15 minutes. When the defrost is completed as indicated by the temperature control calling for refrigeration, the evaporator shall be examined and the degree of defrosting determined. The refrigerator shall then be operated without manual readjustment of the temperature control until the general food compartment temperature has been observed for at least two thermostat cycles or at least one hour, whichever is longer, to permit determination as to whether at least limited refrigeration is provided.

4.3.4.2 Type III Manually-initiated Defrost.--The refrigerator shall be operated under conditions of 4.3.1 and 4.3.4. Preliminary to the main defrost test a defrost cycle shall be initiated manually after approximately 4 hours of operation. At the conclusion of this defrost cycle a period of frost accumulation shall be started. The refrigerator door shall be opened wide for a period of 30 seconds 4 times per hour at the beginning of each hour at 5 minute intervals. Temperature observations of frozen food storage compartment and general food compartment shall be made at equal intervals not greater than 30 minutes, one of which shall be made just prior to the first door opening each hour. The door openings shall be continued for 20 hours and at the end of the twentieth hour a defrost cycle shall be manually initiated. Temperature observations shall be made at not greater than 5 minute intervals throughout the defrost cycle and the temperature rise of the frozen food and general food compartment shall be based on the highest average temperature observed during the defrost and the average temperature observed immediately following initiation of defrost. The door shall not be opened during this defrost cycle or during a recovery period which shall follow immediately. The recovery period shall commence when the general food compartment begins to drop in temperature and shall be continued for 4 hours, during which time temperature observations shall be made at equal intervals not greater than 30 minutes. The 20-hour period of door openings shall then be repeated and the refrigerator again defrosted by manual initiation exactly as before. Immediately after this defrost cycle, the refrigerator shall be opened and examined for degree of defrosting accomplished.

4.3.4.3 Type II & IV Automatically-initiated Defrost.-- The refrigerator shall be operated under conditions of 4.3.1 and 4.3.4. Preliminary to the main defrost test such mechanical operations (as timer adjustment, door openings, etc.) shall be applied as are required to cause an automatic initiation of a defrosting cycle after approximately 4 hours of operation. At the conclusion of this defrost cycle a period of frost accumulation shall be started. The refrigerator door shall be opened wide for a period of 30 seconds 4 times per hour at the beginning of each hour at 5 minute intervals. Observations of frozen food storage temperature (for Type IV) and general food compartment temperature shall be made at equal intervals not greater than 30 minutes, one of which shall be made just prior to the first door opening each hour. The door openings shall be continued for 20 hours and until the first automatically-initiated defrost occurs following the 20 hour period. Observation of frozen food and general food compartment temperatures shall be made at equal intervals not greater than 5 minutes throughout this defrost cycle and the temperature rise of the frozen food and general food compartment shall be based on the highest average temperature observed during defrost and the average temperature observed immediately following initiation of defrost. If initiation of the first defrost following the end of the 20-hour frost accumulation period occurs during a door-opening period, the door shall be closed immediately and shall not be opened during this defrost cycle or during a recovery period which shall follow. The recovery period shall commence when the general food compartment temperature begins to drop and shall be continued for four hours, during which time temperature observations in the general food and drozen food storage compartments shall be made at intervals not greater than 30 minutes. The 20-hour period of door openings shall then be repeated exactly as before and continued until the first automatic initiation of defrost after the 20-hour period. Immediately following this defrost the refrigerator shall be opened and examined for degree of defrosting accomplished.

If a refrigerator that defrosts on every off-cycle does not cycle during the 20-hour frost accumulation period, the door openings shall be discontinued at the end of this 20-hour period and the first defrost which then occurs shall be observed. The refrigerator shall then be operated for a recovery period of 4 hours as outlined in the preceding

paragraph. The 20-hour period of door openings shall then be repeated exactly as before and a defrost cycle allowed to occur thereafter, followed immediately by an inspection of the cooling surface to determine the degree of defrosting accomplished. Observation of frozen food and general food compartment temperatures shall be made in the same manner as outlined in the preceding paragraph.

If a refrigerator defrosts 10 times before the end of the 20-hour frost accumulation period, the door openings shall be discontinued after the tenth defrost and the refrigerator permitted to recover for 4 hours. The test shall be concluded by inspecting to determine the degree of defrosting accomplished immediately following the first defrost after the 4-hour recovery period. Temperature observations during this test shall be made in the same manner as outlined in the first paragraph of 4.3.4.3. The temperature rise of the general food and frozen food storage compartments during defrost shall be based on the highest average temperature observed during the tenth defrost and the average observed immediately after initiation of the tenth defrost.

4.3.5 Temperature Control Test: (See 3.5.1.1 and 3.5.1.2)

4.3.5.1 Temperature differential.--The general food compartment temperature shall be determined as the average of the temperatures T_1, T_2, and T_3 in Figures 1 through 5 and the frozen food storage compartment temperature shall be determined as the average of the 3 or 4 thermocouples in this compartment observed at equal time intervals of 15 minutes or less during the three no-load operating tests described in 4.3.2.1 to 4.3.2.3. The temperature differential in each compartment for each test shall be the difference between the mean of the two highest and two lowest average values determined in the above manner.

4.3.5.2 Temperature Range.--The refrigerator shall be operated under the general conditions of 4.3.1 with the ambient temperature controlled at 90° F ±2F. In two successive tests with the temperature control set at the lowest and the highest settings that result in cyclic operation (not shunted), respectively, the refrigerator shall be operated until repetitive temperatures are observed in the general food storage compartment during successive thermostat cycles. The refrigerator shall be

operated for a test period of two hours or two complete thermostat cycles whichever is longer after repetitive temperatures are observed for each control setting. Temperature observations shall be made continuously or at equal time intervals not greater than 15 minutes in the general food storage compartment during the test period and the arithmetic average of all readings so taken shall be the average general food compartment temperature for each control setting.

4.3.6 Sweating Test (See 3.5.4). The refrigerator shall be operated for a period of not less than eight (8) hours at a control setting that produces an average general food compartment temperature of 39°F ±1F as determined in 4.3.2.1 and in an ambient temperature of 90°F ±1F and a relative humidity maintained between 73 and 78% at all times.

At the end of the eight-hour test the entire exterior of the refrigerator including door latch, hinges, and visible portion of the door gasket shall be inspected for condensation visible to the eye or detectable by wiping with the fingers.

4.3.7 Motor Overload Protection Test.

4.3.7.1 Motor overload protective device.--Each sample refrigerator shall be operated on a line voltage as specified ±2 volts in an ambient temperature of 90°F ±2F with the heat transfer from the air-cooled condenser restricted sufficiently to cause the compressor motor overload protective device to function. This test shall be continued until four successive measurements of compressor winding temperature at time of overload trip-out indicate repetitive values.

4.3.7.2 Failure of starting mechanism.--The starting winding of all single-phase compressor motors and one power lead to all three-phase compressor motors shall be disconnected and specified voltage ±2 volts applied to the service connection of the refrigerator. This test shall be continued for two hours or until four successive measurements of compressor-motor running-winding temperatures at time of overload trip-out indicate temperature equilibrium. (note.--For three-phase motors the temperature observations shall be made of the energized winding.)

4.3.7.3 Locked-rotor test of fan motors.--Fan motors if used, shall be energized with the rotor locked for a period of two hours or until four successive readings indicate that the temperature of motor windings has reached a steady state. The resistance of the fan-motor windings shall be measured each time the overload protective device functions, or at 15-minute intervals if the motor is not equipped with an overload protective device.

4.3.7.4 Temperature of motor windings. The temperature of the compressor and fan motor windings shall be determined by the following formula for copper conductors:

$$t_h = (390+t_c)\frac{R_h}{R_c} - 390$$

where t_h is the temperature of the motor windings when disconnected from the circuit by the overload device, °F.

t_c is the temperature of the motor windings when the motor is cold and in equilibrium with the ambient temperature, °F.

R_h is the resistance of the motor windings hot.

R_c is the resistance of the motor windings at temperature t_c.

The temperature of the compressor and fan motor windings shall not exceed 302°F. based on the average of the four highest observations taken.

4.3.8 Moisture content of refrigerating system.--After at least 1 hour of continuous operation of the motor-compressor unit in an ambient temperature of 90°F. with the door open and with the refrigerator empty, the refrigerator shall be disconnected from the electric supply and allowed to stand for 1 hour with the door open. A sample of refrigerant vapor shall then be withdrawn from the low-pressure side of the system and its moisture content determined by either the gravimetric method employing P_2O_5 or the electrical method employing hygroscopic film for compliance with the moisture content requirements of 3.6.

4.3.9 Drop Test.--The drop test required in paragraph 3.4.1 shall be conducted in the following manner: All shelves shall be loaded at 12 pounds per square foot, with the weight generally distributed over the shelf area. The material used for shelf loading shall either be non-rigid or shall consist of increments, each covering not more than 10% of the particular surface under test. All trays (including special purpose vessels such as ice-cube trays, crispers, drip trays, butterkeepers, etc.) furnished with the refrigerator, which are normally used for storage of food items, shall be filled to the equivalent of 50% of normal capacity by volume with suitable materials, not in liquid form, having an overall density of 35 pounds per cubic foot. One side of the refrigerator at a time shall then be raised three inches off a level concrete floor and be allowed to drop free in the following order, left side, rear, right side, front. The refrigerator shall be held in the elevated position for the drop test by a single support which can be withdrawn so the refrigerator is not hampered in its free fall or caused to fall in a plane other than parallel to the specified direction of fall.

4.3.10 Tests for porcelain enamel.

4.3.10.1 Thickness of enamel.--The thickness of the porcelain enamel shall be measured at three spots with a magnetic thickness gage or other suitable means accurate to plus or minus 0.001 inch, and the average thickness at the three measured spots shall be taken as the thickness of the enamel for the piece. (See 3.8.4.2.1)

4.3.10.2 Reflectance test.--The reflectance of white porcelain enamel shall be determined on an instrument having the characteristics of the Multipurpose Photoelectric Reflectometer, using the green filter, as described in Research Paper RP1345 published in the National Bureau of Standards Journal of Research, 25 (5) 581--618 (1940), or by the integrating sphere method described in the Illuminating Engineering Society Transactions for 1920 or the Journal of the Optical Society of America, 28, 372 (1938). As an alternative, the reflectance may be compared visually to a plate having the minimum allowable reflectance, such plate having been previously standardized with a reflectometer. In case of doubt as to whether the specimen meets the

requirements, reflectometer measurements shall be used. (See 3.8.4.2.1).

4.3.10.3 Acid-resistance test (for porcelain-enameled liners only).--A solution containing 10 grams of crystalline citric acid per 100 milliliters of distilled water shall be prepared not more than 24 hours prior to use. The test shall be made on a horizontal (bottom) interior surface of the liner. The area to be tested shall be cleaned by washing with soap and water, rinsing, and drying with a clean towel. With the specimen and acid solution at 80° ± 10°F., several drops of acid solution shall be placed on the specimen to form a pool and immediately covered with a 1-inch inverted watch glass. After 15 minutes of treatment, the watch glass shall be removed and the acid solution immediately rinsed from the test surface. The specimen shall be dried with a clean towel by blotting (not rubbing). Place a small light source, such as a frosted lamp bulb, inside the liner so its reflected image can be observed as a highlight in the untreated area of the liner bottom, the line of vision being within 45° of the perpendicular to the surface. Focus the eyes on the image of the light source, not the enamel surface. Then shift the head or the light source just sufficiently to bring the image of the light source into the treated area observing it as it passes the boundary line. Any color difference in the enamel due to staining shall be ignored, but if a definite blurring of the image is observed as it passes from the untreated to the treated area, or if the image disappears, the specimen fails the test, otherwise it passes. (See 3.8.4.3).

4.3.11 Tests for plastic parts.

4.3.11.1 Styrene and laminated thermosetting plastics--Thermal expansion of door liners. Plastic door liners shall not crack, craze or become permanently distorted when subjected to the following tests:

1. The assembled door shall be permitted to come to thermal equilibrium at 150°F and then at 0°F. The door may be removed from the refrigerator for this part of the test.

2. The door shall then be reinstalled on the refrigerator, closed and permitted to come to

steady state with the interior refrigerator temperature at the lowest value obtainable with continuous operation of the refrigerating unit in an ambient temperature of 110° F.

5. Preparation for Delivery

5.1 Packing.--Refrigerators, including electrical equipment, shall be packed for shipment to permit acceptance by carrier for transportation at the lowest applicable rate, and to afford maximum protection from normal hazards of transportation. Packing shall be in accordance with Federal Specification RR-P-0021.

5.2 Packaging.--Packaging shall be in accordance with Federal Specification RR-P-0021. When crates are used, refrigerators shall be provided with protective covering to guard against damage from dust and moisture.

5.3 Marking.--Marking shall be in accordance with Federal Specification RR-P-0021.

5.3.1 Shipping containers shall be marked with the name of the commodity, the type, the size, and the quantity contained therein, as defined by the contract or order under which shipment is made, the name of the contractor, and the number of the contract or order.

5.3.2 In addition to the above marking, cases or crates containing motors, controllers, and spare parts and tools for same, shall be marked to show the applicable voltage and current characteristics.

6. Notes

6.1 Ordering data.--Purchasers should exercise any desired options offered herein and should specify the following, as applicable:

(a) Required type and size (see 1.2.1, 1.2.2 and Table I.

(b) Required voltage and kind of current, including phases, and frequency if alternating current.

(c) Limiting dimensions (if different from those required by table I).

(d) Components and equipment not required by this specification. (See 3.6).

(e) Exterior casing and interior liner materials permitted or desired if other than steel. (See 3.8.4.1 and 3.8.4.3).

(f) Color of exterior casing, interior liner and door liner, if particular color(s) are desired other than as specified. (See 3.8.4.2, 3.8.4.3 and 3.8.4.4).

(g) Required door swing, right or left. (See 3.8.6).

(h) Type of refrigerating system:
For 50 or 60 cycle alternating current specify type of hermetic system desired if both are not acceptable. (See 3.9.2). For direct current or other than 50 or 60 cycle alternating current specify open type system.

(i) Sampling procedure for acceptance inspection and tests if different from that specified in 4.2.2. Specify where acceptance inspection and tests shall be made.

(j) Whether services of an installation mechanic are required. (See 6.6).

(k) Type of packaging and packing required, domestic or overseas. (See 5.1 and 5.2).

(l) Designate special features required, such as top or bottom location of frozen food compartment, defrosting of frozen food compartment if separate cooling surfaces are provided for general food and frozen food compartments, special vessels, etc., which are available in some models but are not covered as options by this specification.

6.2 Pre-award examination.--Purchasing officers may, at their option, include the following paragraph in their invitation to bid, contract, or order:

Pre-award examination.--The purchaser shall have the right as part of the pre-award survey, to require any

bidder upon twenty days' notice to make available to the purchasing officer or his representative, a sample of each item bid upon to determine compliance with the specifications. If the samples offered for examination are found not to be in conformity with the specifications, this may result in the rejection of an otherwise acceptable bid. Examination of samples will be made at the factory designated by the bidder in his bid, unless otherwise specified in the invitation to bid, contract or order.

6.3 Deviations from requirements.--Purchasing officers may, at their option, include the following paragraph in their invitation to bid, contract, or order:

Deviations from requirements.--Any deviation from the general requirements and construction requirements (section 3) which provides quality equal or superior to the requirements of this specification, and which is noted as an exception by the contractor in his bid, will be given consideration. The burden of proof of such equal or superior quality shall rest on the contractor and the purchasing officer shall have the option of determining the validity of such proof by any means suitable to him.

6.4 Manufacturer's agents.--Bidders should be required to supplement their bids with a list giving the names of the distributors or agents who will furnish the service referred to in 6.6 to the various stations listed in the invitation to bid.

6.5 Service guarantee.--It is suggested that purchasing officers include the following clause in their invitation to bid, contract, or order:

Service guarantee.--The contractor guarantees the equipment against defective material, workmanship, and performance for a period of one year, said guarantee to run from date of acceptance of the equipment by the Government. The contractor agrees to furnish, without cost to the Government, replacement of all parts and material which are found to be defective during the guarantee period. Replacement material and parts shall be furnished to the Government at point of installation if installation is within the continental United States, or f.o.b. the continental United States port to be designated by the purchasing officer if installation is outside of the continental United States. Cost of installation of replacement material and parts shall be borne by the Government.

6.6 Installation supervision and adjustment.--Purchasing officers may, at their option, include the following paragraph in their invitation to bid, contract, or order:

The contractor shall provide the services of a representative to make all necessary adjustments of equipment at the time of installation.

Patent notice.--When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

7. Departmental Requirements*

7.1 Departmental specifications and other publications.--The following departmental specifications and other publications of the issues in effect on date of invitation to bid, and special requirements, shall form a part of this specification, and shall be applicable to purchases made under this specification by the respective departments.

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*The departmental requirements as listed in Federal Specification AA-R-211c are not included in this proposed draft. The latest departmental requirements available for a similar item (Federal Specification 00-C-566c, January, 1954, Dispenser, Drinking Water, Mechanically-cooled) have been edited and one Military Specification (MIL-P-12323A, Packaging of Refrigerators) has been added for inclusion in this proposed draft. This section should be modified, if necessary, in light of the latest Military packing, packaging and marking requirements, and MIL-P-12323A should be properly referenced.

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7.2 Army, Navy and Air Force.

7.2.1 Applicable specifications and other publications:

Federal Specifications:

NN-B-591--Boxes; Fiberboard, Wood-Cleated (for Domestic Shipment).[4]
NN-B-601--Boxes; Wood-Cleated-Plywood, for Domestic Shipment.[4]
NN-B-621--Boxes; Wood, Nailed and Lock-Corner.[3]
UU-P-268--Paper, Kraft, Wrapping (With Conservation Provision).[5]
UU-T-111--Tape, Paper, Gummed (Sealing and Securing).[4]
UU-T-116--Tape, Paper, Gummed, Water-Resistant.[1]
LLL-B-631--Boxes; Fiber, Solid (for Domestic Shipment).[2]

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[1]Applicable to Navy purchases only.
[2]Applicable to Army purchases only.
[3]Applicable to Air Force purchases only.
[4]Applicable to Army and Air Force purchases only.
[5]Applicable to Navy and Air Force purchases only.

Military Specifications:

JAN-P-103--Packaging and Packing for Overseas Shipment--Boxes; Wood-Cleated, Solid Fiberboard.[5]
JAN-P-104--Packaging and Packing for Overseas Shipment--Crates, Sheathed, Wood, Nailed.
JAN-P-105--Packaging and Packing for Overseas Shipment--Boxes; Wood, Cleated, Plywood.
JAN-P-106--Packaging and Packing for Overseas Shipment--Boxes; Wood, Nailed.
MIL-P-116--Packaging and Packing for Overseas Shipment--Preservation, Methods of.[5]
JAN-P-125--Packaging and Packing for Overseas Shipment--Barrier-Materials, Waterproof, Flexible.[3]
JAN-P-127--Packaging and Packing for Overseas Shipment--Tape, Adhesive, Pressure-Sensitive, Water-Resistant.[5]
JAN-P-132--Packaging and Packing for Overseas Shipment--Crates; Unsheathed, Wood, Nailed (for Maximum Net Load of 2,500 Pounds).[3]
MIL-A-140--Adhesive, Water-Resistant, Waterproof Barrier-Material.[5]

MIL-M-7911--Marking, Identification of Aeronautical Equipment, Assemblies, and Parts.[3]
MIL-P-12323A--Packaging of Refrigerators

Navy Department Specifications:

General Specifications for Inspection of Material.[1]

Military Standards:

MIL-STD-105--Sampling Procedures and Tables for Inspection by Attributes.[2]
MIL-STD-129--Marking of Shipments.

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

7.2.2 Army.

7.2.2.1 Preservation.--None required.

7.2.2.2 Packaging.

7.2.2.2.1 For domestic and overseas shipment.

7.2.2.2.1.1 Fixtures.--Detachable fixtures that protrude from the exterior surface of the refrigerator and that might cause damage or be damaged during shipment shall be removed and cushioned with cushioning fiberboard container constructed to fit the contents in a compact manner in accordance with style RSC of Federal Specification LLL-B-631. The container shall be sealed with gummed paper tape conforming to Federal Specification UU-T-111, minimum width 2 inches. The container shall then be secured in a fixed position within the refrigerator cabinet.

7.2.2.2.1.2 Floating mechanism.--Floating mechanisms shall be secured immobile to prevent vibration and subsequent damage during handling and shipment.

7.2.2.3 Packing.

7.2.2.3.1 For domestic and overseas shipment.

7.2.2.3.1.1 Cushioning.--The refrigerator shall be cushioned and held securely within the container by placing edge pads over the full length of all edges of the refrigerator. The edge pads shall be built up of double-face corrugated fiberboard, extending 3 inches in from the edge on both surfaces of the refrigerator and to a minimum thickness to provide a tight pack and a 1-inch clearance between the outermost projection of all surfaces of the refrigerator and all adjacent inside surfaces of the container. For overseas shipment, the cushioning material shall be water resistant.

7.2.2.3.1.2 Protection of finished surface.--One of the following shall be placed between the fiberboard pads and the finished surfaces of the refrigerator:

a. A sheet of kraft paper weighing not less than 30 pounds per ream (24 by 36--500) dry waxed on both sides with a total of not less than 8 pounds nor more than 12 pounds per ream (24 by 36--500) of fully refined wax having a melting point of not less than 132°F. Total weight of finished sheet shall be not less than 40 pounds per ream (24 by 36--500).

b. A sheet or pad of creped cellulose wadding having a thickness of not less than 0.14 inch, surfaced on the side contacting the fiberboard pads with kraft paper having a minimum basis weight of 30 pounds per ream (24 by 36-500).

7.2.2.3.1.3 Containers.--Exterior containers shall be constructed according to table IV, except the bases of cleated fiberboard or cleated plywood containers shall be constructed of two nominal 1- by 4-inch headers (end floor members) secured in a right-angle position to two nominal 2- by 4-inch skids. Bases for overseas containers shall have a sheet of plywood, as required in the applicable specification, between the skids and headers. The side panels of the containers shall extend down to within 1/4 inch of the bottom of the skids and shall be secured to the sides of the skids. The end panels of the containers shall rest on top of the skids between the side panels and shall be secured to the edge of the headers (end floor members). Type C untreated plywood shall be used in overseas container body material.

Table IV.--Exterior container requirements

Specification No.	Classification	Shipment
NN-B-591----	Style A---	Domestic (Weight of contents to 400 lbs.)
NN-B-601----	Style A---	Domestic (Weight of contents to 500 lbs.)
JAN-P-104---	Type I----	Domestic (Skid base--Weight of contents exceeding 500 lbs.)
JAN-P-105---	Style A---	Overseas (Weight of contents to 500 lbs.)
JAN-P-104---	Type I----	Overseas (Skid base--Weight of contents exceeding 500 lbs.)

When the weight of contents of containers constructed in accordance with Military Specification JAN-P-104 do not exceed 1,000 pounds and the inside dimensions do not exceed 4 feet long, 3 feet wide, and 3 feet 6 inches deep, the frame members of the sides, ends, and top, shall be of 1- by 4-inch material.

Top coating material and waterproof barrier material shall not be required on the top of crates for domestic shipment.

7.2.2.4 Marking.--Each exterior container shall be marked in accordance with Military Standard MIL-STD-129, and in addition, arrows shall be prominently painted or stenciled on the two sides and two ends of the container indicating the position in which the container shall be handled in transit and storage. The word "UP" shall appear at the point of each arrow in letters not less than 2 inches high.

7.2.2.5 Sampling.--Sampling shall be conducted in accordance with Military Standard MIL-STD-105.

7.2.3 Navy.

7.2.3.1 Preservation.--All exposed uncoated metal surfaces shall be cleaned with petroleum solvent and when dry, coated

with rust-preventive compound conforming to type P-2 of Military Specification MIL-P-116. All inlets, outlets, and openings into motors over electric switches shall be sealed with tape conforming to the requirements for type I, grade B, of Military Specification JAN-P-127.

7.2.3.2 Packaging.

7.2.3.2.1 For domestic shipment (immediate use).--Commodity shall be protected by a shroud of 60-pound-basis-weight kraft paper conforming to Federal Specification UU-P-268. The overlaps shall be sealed with gummed paper tape, 2-1/2 inches wide and conforming to the requirements of Federal Specification UU-T-116.

7.2.3.2.2 For overseas shipment.--Commodity shall be protected by a shroud of waterproof barrier-material conforming to Military Specification MIL-A-140.

7.2.3.3 Packing.

7.2.3.3.1 For domestic shipment (immediate use).--When specified by the procuring agency, the subject commodity packaged as described in 7.2.3.2.1 shall be packed in substantial commercial exterior containers conforming to the Consolidated Freight Classification Rules in effect at time of shipment. The gross weight of wood boxes shall not exceed approximately 200 pounds, except where the weight of an individual item exceeds this amount. The gross weight of fiberboard boxes shall be subject to the weight limitations indicated on the box maker's certificate.

7.2.3.3.2 For overseas shipment.--Commodity, prepared as specified in 7.2.3.1 and 7.2.3.2 shall be individually secured by blocking, bracing, and cushioning in containers constructed to fit the contents in a compact manner in accordance with the requirements of Military Specification JAN-P-103, style A or B; JAN-P-104; JAN-P-105, style A or B; or JAN-P-106, style 2 or 4. Only one type and style of container shall be used on any one shipment.

7.2.3.4 Marking.--In addition to any special marking required by the contract or order, shipments shall be marked in accordance with Military Standard MIL-STD-129.

7.2.3.5 Ordering data.--Procurement documents should specify whether domestic or overseas shipment is required.

7.2.3.6 Inspection procedures.--General inspection procedures shall be in accordance with General Specifications for Inspection of Material.

7.2.3.7 Bureau of Ships.--Such purchases will be made under the applicable Military Specification.

7.2.3.8 Other Naval activities.--Such purchases will be made under this Federal Specification.

7.2.4 Air Force.

7.2.4.1 Preservation.

7.2.4.1.1 For domestic shipment.--Commercial preservation will be acceptable.

7.2.4.1.2 For overseas shipment.--All exposed uncoated metal surfaces shall be cleaned with petroleum solvent and when dry, coated with rust-preventive compound conforming to type P-2 of Military Specification MIL-P-116. All inlets, outlets, and openings into motors over electric switches shall be sealed with tape conforming to the requirements for type I, grade B, of Military Specification JAN-P-127.

7.2.4.2 Packaging.

7.2.4.2.1 For domestic shipment.--Commodity shall be protected by a shroud of 60-pound-basis-weight kraft paper conforming to Federal Specification UU-P-268. The overlaps shall be sealed with gummed paper tape, 2-1/2 inches wide and conforming to Federal Specification UU-T-111.

7.2.4.2.2 For overseas shipment.--Commodity shall be protected by a shroud of waterproof barrier-material conforming to Military Specification JAN-P-125. The overlaps shall be sealed with adhesive conforming to Military Specification MIL-A-140.

7.2.4.3 Packing.

7.2.4.3.1 For domestic shipment.--Commodity, prepared as specified in 7.2.4.1, shall be individually secured by blocking, bracing, and cushioning in containers constructed to fit the contents in a compact manner and in accordance with the requirements of Federal Specification NN-B-591,

style A or B; NN-B-601, style A or B; NN-B-621, style 2 or 4; or Military Specification JAN-P-132. When fiberboard exterior containers are used, such containers shall be fabricated from fiberboard having a Mullen test of 275 pounds or more. Only one type and style of container shall be used on any one shipment.

7.2.4.3.2 For overseas shipment.--Commodity, prepared as specified in 7.2.4.1 and 7.2.4.2, shall be individually secured by blocking, bracing, and cushioning in containers constructed to fit the contents in a compact manner in accordance with the requirements of Military Specification JAN-P-103, style A or B; JAN-P-104; JAN-P-105, style A or B; or JAN-P-106, style 2 or 4. Only one type and style of container shall be used on any one shipment.

7.2.4.4 Marking.--In addition to any special marking required by the contract or order, shipments shall be marked in accordance with Military Standard MIL-STD-129. The nomenclature for refrigerators shall be as follows:

Refrigerators, Electric, Self-Contained, Domestic Type.
Type -- (*) Size --(*) Electrical Data --(*)--.
Direction of Door Swing--(*).

*Applicable data to be entered by the contractor.

7.2.4.5 Identification of product.--Equipment, assemblies, and parts shall be marked for identification in accordance with Military Specification MIL-M-7911. The identification data applied to the Refrigerator shall be as follows:

Refrigerator, Electric, Domestic.
Type--(*), Size--(*)--
Electrical Rating--(*)--
Specification No.--(*)--
Stock No.--(*)--
Mfr's Part No.--(*)--
Serial No.--(*)--
Contract or Order No.--(*)--
Mfr's Name or Trade-mark--(*)--
U.S. Property

*Applicable data to be entered by the contractor.

7.2.4.6 Ordering Data - Procurement documents should specify whether domestic or overseas shipment is required.

NAVY INTEREST: MC S Y

THE NATIONAL BUREAU OF STANDARDS

Functions and Activities

The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to Government Agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. A major portion of the Bureau's work is performed for other Government Agencies, particularly the Department of Defense and the Atomic Energy Commission. The scope of activities is suggested by the listing of divisions and sections on the inside of the front cover.

Reports and Publications

The results of the Bureau's work take the form of either actual equipment and devices or published papers and reports. Reports are issued to the sponsoring agency of a particular project or program. Published papers appear either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three monthly periodicals, available from the Government Printing Office: The Journal of Research, which presents complete papers reporting technical investigations; the Technical News Bulletin, which presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: The Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications.

Information on the Bureau's publications can be found in NBS Circular 460, Publications of the National Bureau of Standards ($1.25) and its Supplement ($0.75), available from the Superintendent of Documents, Government Printing Office. Inquiries regarding the Bureau's reports and publications should be addressed to the Office of Scientific Publications, National Bureau of Standards, Washington 25, D. C.


NBS